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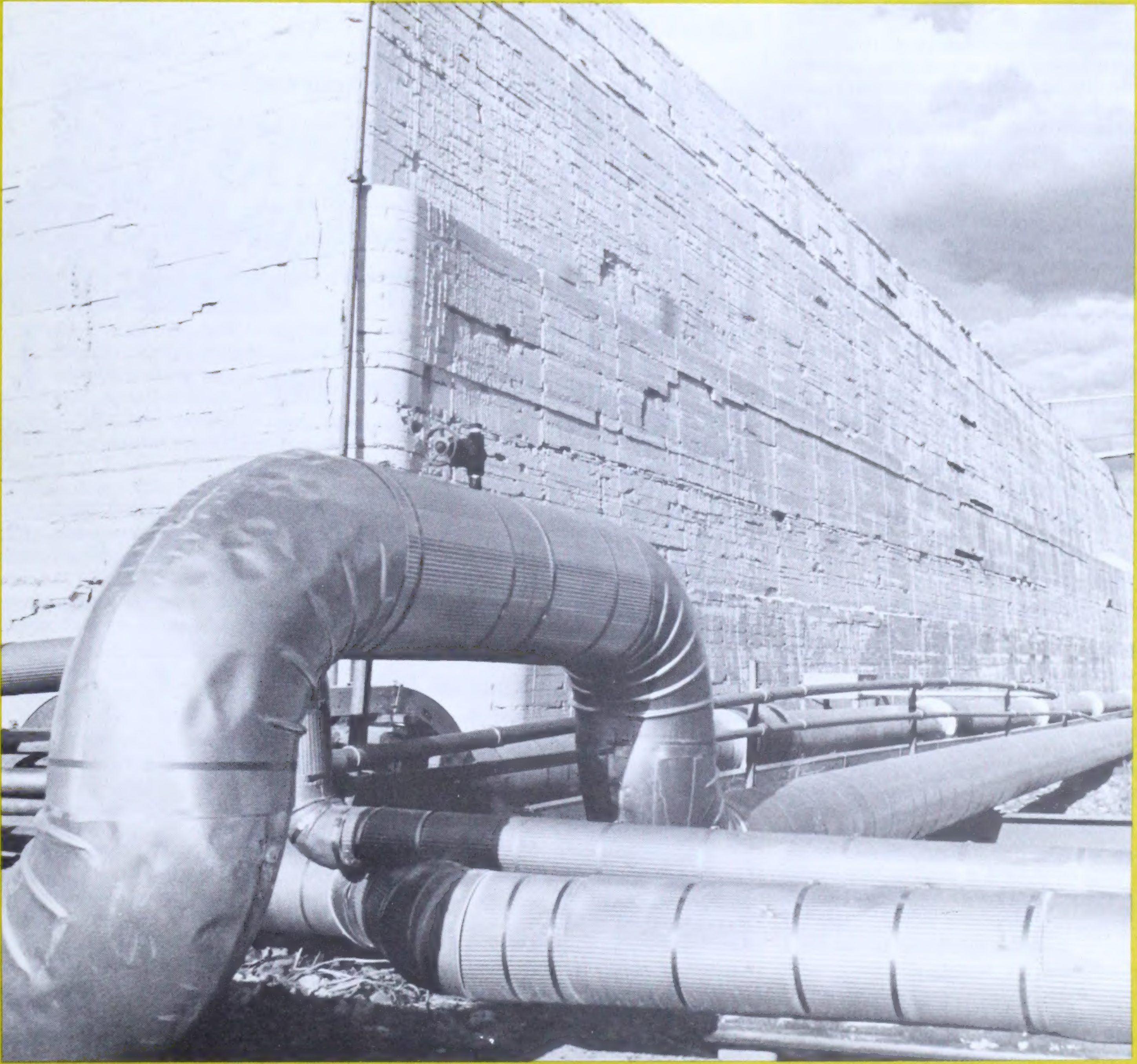

## Sour Gas

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# ENVIRONMENT VIEWS

SECOND CLASS MAIL
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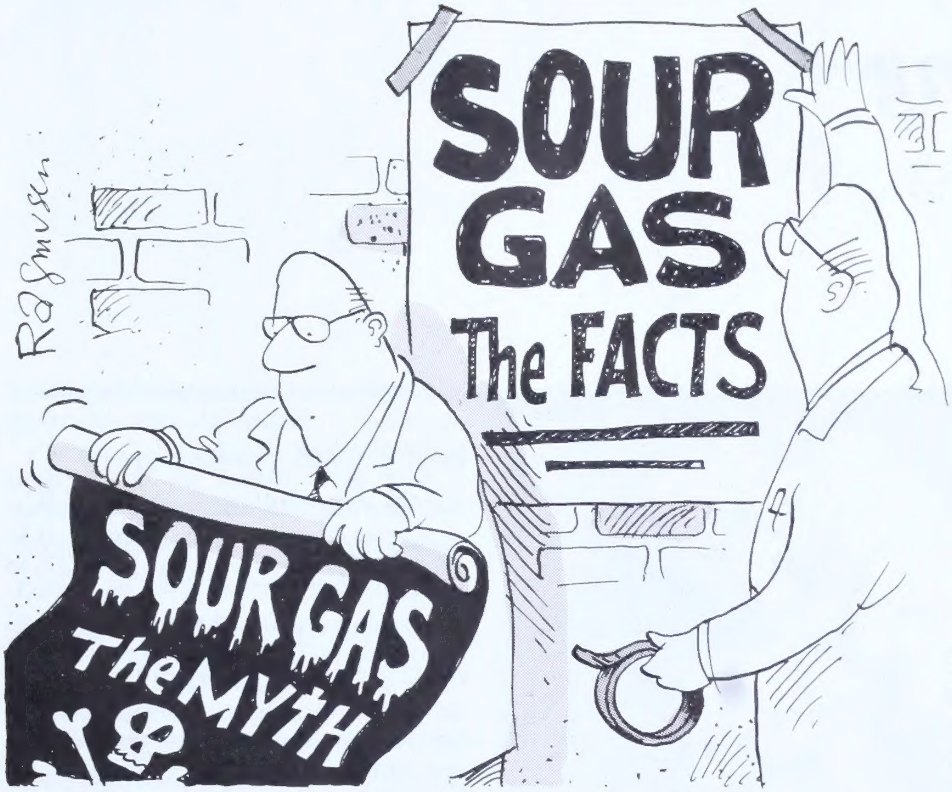
**Cover Photo: R.C. MacKenzie**

Alberta
ENVIRONMENT

# Editor's Notebook



GERRY RASMUSSEN

The Energy Resources Conservation Board recently compiled a list of the questions asked most frequently at public hearings and meetings on the topic of sour gas. With brief answers to these, their publication entitled *Everything You Ever Wanted to Know About Sour Gas . . . Without Being Afraid of It* makes interesting reading. Despite the enormous importance of the sour gas industry to Alberta, public knowledge of its workings and impact seems to be minimal. Media coverage has generally been limited to the real and perceived dangers, leaving unanswered such questions as: What is sour gas? What makes it sour? Why is it difficult to control? How do gas plants work?

We've gone a little further than the ERCB's publication in tackling these questions in this issue of *Environment Views*. As they did, we started at the beginning, attempting to describe the resource and explain the drilling and refining processes as background for an understanding of such environmental and social issues as regulation of the industry and its environmental and health impacts.

We discovered in researching stories on the impacts of sour gas that there is much not yet proven. The reported health effects on people living near sour gas plants in the Pincher Creek area are very real, but the causes far from proven (story p. 16). Much of the concern about specific toxic effects (other than the well-documented risks from hydrogen sulphide and sulphur dioxide) is based on data which is may not be conclusive (story p. 14). Research continues and in fact, because of Alberta's large sour gas reserves, Alberta is at the forefront of much of this work.

The well blowout at Lodgepole was a milestone in the province's sour gas history. Much was learned from it to help prevent a similar or worse occurrence in the future, and it made a great and lasting impact on the public's awareness of sour gas (story p. 29).

The editorial board always draws upon people in the field to help with planning each issue, and to provide contacts for our writers. For this complex issue in particular, we relied upon patient and knowledgeable people in both government and industry who gave hours of their time, not only at the early stages but also after the stories were written, helping to make sure the material was technically correct and all the information was current. Lack of space (and fear of missing anyone) keeps me from naming all those who gave so much time, but thank you. Although *Environment Views* uses department staff and contract people for research, writing and editing, the magazine relies heavily on the help of interested and committed volunteers. As board members and resource people, they help us identify topics of current usefulness and keep abreast of the latest developments.

Maryhelen Vicars, a former journalist, is the freelance editor of *Environment Views*.

# Letters

## Reclamation Important Topic

Dear Editor;

As editor of the Canadian Land Reclamation Association's Reclamation Newsletter, I would like to compliment you and your staff on the space devoted to reclamation in recent issues (6(6), 7(4), 7(5)).

Keep up the good work!

Chris Powter
Editor

## Management Key to Effective Research

Dear Editor:

I would like to thank you for devoting the last two issues of *Environment Views* to environmental research. As far as I can recall, this is the first time that any public document has taken such a wide perspective on environmental research in Alberta. You will be pleased to know that Environment Views is read far and wide, as two people from Toronto and Winnipeg have mentioned these issues to me.

I would like to add some comments to those already contained in your articles, based on my several years of funding research and managing a division in Alberta Environment, and on my past three years as a research management consultant.

It is interesting to see how broad a field environmental research is considered to be. The many areas of research discussed certainly do not fall within any one jurisdiction, politically or administratively. From a jurisdictional standpoint, research mentioned would come under the responsibility of several government departments, such as Energy and Natural Resources, Agriculture, Environment, and probably others. This indicates the difficulty environmental research managers can face when establishing research priorities and answering public inquiry why research is not being done in a certain area. There may be some truth in Dr. Sherman Weaver's statement that "By definition, environmental research is anything . . . that affects life."

What struck me also was the overwhelming focus on biophysical aspects of environmental research. I don't consider that your writers have neglected other aspects of environmental research, but it indicates what the scientific community emphasizes.

*Letters continued on page 35*

R.C. MacKenzie

# Understanding Sour Gas

## A boon and a threat

Burning acid at the Turner Valley field, ca. 1930.

PROVINCIAL ARCHIVES OF ALBERTA

Alberta's sour gas industry is 60 years old. Each year it contributes about a billion dollars to the province's economy and its supply of byproduct sulphur has become so important to world fertilizer markets it's been estimated that millions of people in underdeveloped nations would starve if Alberta's sour gas industry suddenly shut down.

Given its importance to Alberta's economy, why, then, are numerous Albertans fearful of sour gas and why do they claim it can have an adverse impact on their well-being?

The easy answer is "because sour gas contains poisonous hydrogen sulphide" but public hearings have revealed that many people are upset because they think sour gas facilities will somehow disrupt their means of making a living. To understand the situation requires an examination of the industry as a whole. To begin with, some definitions and statistics are in order.

Sour gas is natural gas that contains hydrogen sulphide, a substance commonly designated by its chemical formula, $H_2S$. Natural gas that is free from $H_2S$ is said to be "sweet".

There are about 22,000 natural gas wells in Alberta. In 1982 sour gas wells supplied 45 per cent of total natural gas production. Of the 1.9 trillion cubic metres of gas still in the ground, most is sweet (77 per cent), the rest (23 per cent) is sour.

With the exception of the northeast portion of the province, natural gas reservoirs underlie most areas of Alberta and sour gas is found throughout these regions. However, the most significant finds of sour gas lie in four reservoirs that parallel the foothills and are centered on Calgary.

"Sour Gas Alley," as one industry spokesman put it, includes a gas field in the Whitecourt-Edson area; a sizable reservoir underneath Rocky Mountain House, Sundre, Olds and areas east of Highway 2; an area completely surrounding Calgary that extends from the Crossfield in the north to Okotoks and Turner Valley in the south and, lastly, a small but productive gas field in the Waterton-Pincher Creek area.

In 1982, total production of sour gas amounted to 30 billion cubic metres. Most of it (61 per cent) contained less than two per cent hydrogen sulphide. Of the rest, 32 per cent had $H_2S$ in concentrations exceeding 20 per cent.

No one knows for sure why hydrogen sulphide is present in some gas fields and not in others. According to some theories the high temperatures and pressures that transformed vegetable matter into oil and gas million of years ago produced hydrogen sulphide when certain subterranean sediments and rock formations were present.

Once sour gas moves several thousand metres upward through a drilled well and reaches the earth's surface it cannot be used as a fuel until $H_2S$ is removed. That's because hydrogen sulphide can be poisonous

***The rotten-egg odor of hydrogen sulphide can be detected by humans at concentrations of 0.1 parts per million (ppm). It is the same substance given off by Banff's hot springs.***

if it is present in certain concentrations.

The rotten-egg odor of hydrogen sulphide can be detected by humans at concentrations of 0.1 parts per million (ppm). It is the same substance given off by Banff's hot springs.

Hydrogen sulphide concentrations of 150 to 300 ppm can be hazardous to people if they are exposed to it for more than one hour. Concentrations over 600 ppm are rapidly fatal but even at 20 ppm it can irritate eyes and so paralyze sense of smell that its presence cannot be detected.

Depending upon the quantity of $H_2S$ that could escape from a well, a pipeline or a sour gas treatment plant if unrestricted release of gas occurred (such as in a well blowout), human habitation must be kept certain distances from sour gas facilities. This effectively "sterilizes" areas around facilities so that houses cannot be built there, a restriction that is unpopular with land developers.

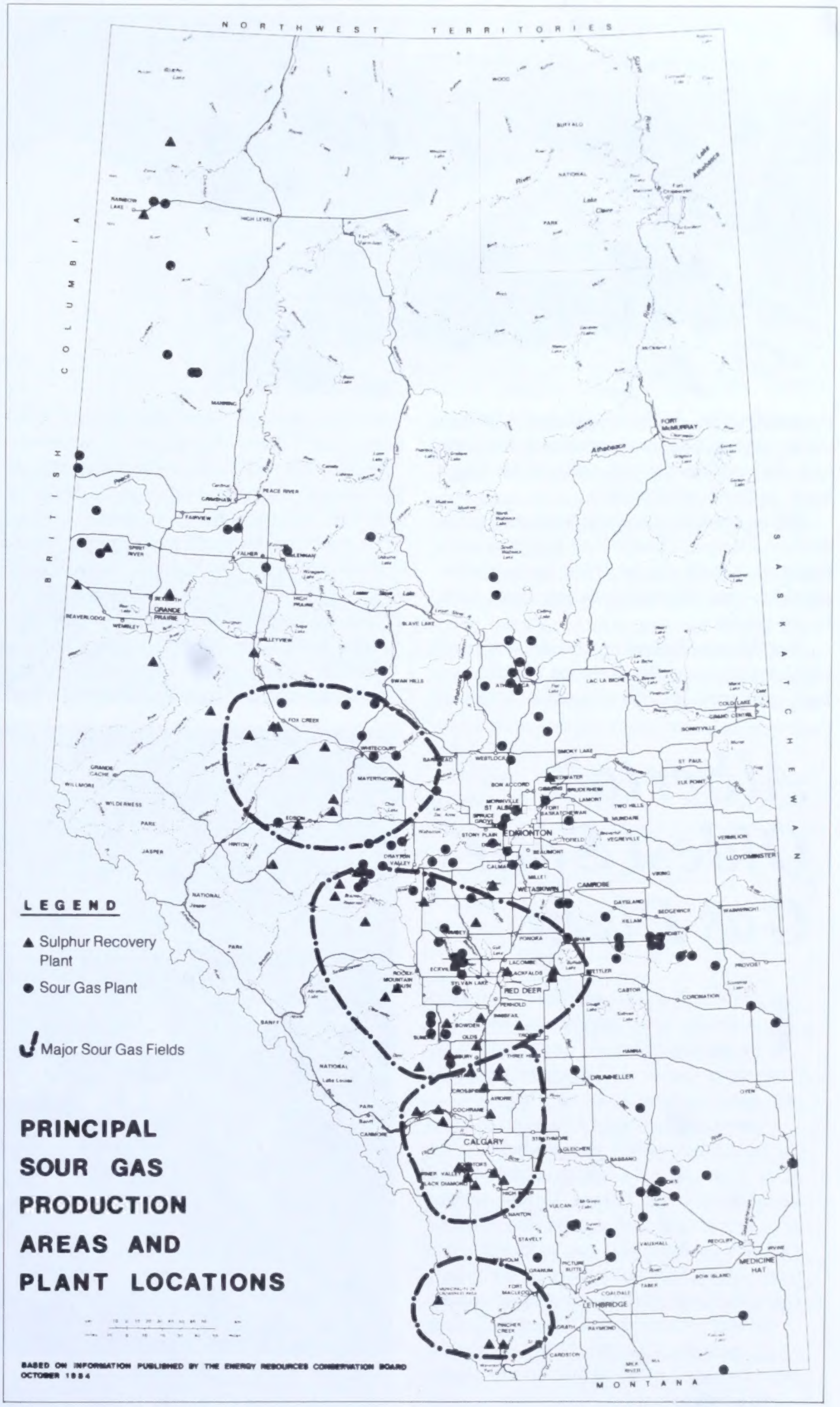
Sour gas wells are connected by pipelines to gas processing plants where hydrogen sulphide is removed. Another contaminant of the gas, carbon dioxide, is also reduced to certain specified limits because it lowers the heating value of natural gas when it is used as a fuel.

Presently there are 135 sour gas plants in the province. Fifty of them process sufficient quantities of gas that they are required to use complex $H_2S$ removal systems that convert hydrogen sulphide into pure, elemental sulphur.

Some of Alberta's sour gas plants, the ones that recover more than 1000 tonnes of sulphur a day, are among the world's largest.

At the other end of the scale, 85 plants, which processes less than the equivalent of 10 tonnes of sulpher (most much less) a day, are not required to use sulphur recovery systems. Instead, they convert $H_2S$ to sulphur dioxide using burners at the tops of tall flare stacks. Neither the large sulphur recovery plants nor the smaller ones use processes that allow removal of $H_2S$ without some of it being expelled as sulphur dioxide.

Emissions of sulphur in the form of sulphur dioxide ($SO_2$) totalled about 700 tonnes per day from all of Alberta's sour gas plants in 1981. To some people this may seem like a lot, especially since $SO_2$ is the villain in acid rain formation. Comparatively speaking, however, Alberta's $SO_2$ emissions are one fourth the combined emissions of Onta-



**PRINCIPAL SOUR GAS PRODUCTION AREAS AND PLANT LOCATIONS**

BASED ON INFORMATION PUBLISHED BY THE ENERGY RESOURCES CONSERVATION BOARD OCTOBER 1984

R.C. MACKENZIE

Sulphur stockpiles at Canterra Resources Ltd.'s Ram River Plant (left).

rio and Quebec. It's been said that Alberta's entire sour gas industry produces less than half the sulphur dioxide emitted by Inco's stack in Sudbury, Ontario.

Before sour gas reaches a processing plant there is always a chance that $H_2S$ leaks can occur at a well site or from transmission pipelines that transport the gas from wells to gas plants.

But the metals used in sour gas wells and pipelines are specially designed to deal with high pressures and the corrosive nature of sour gas. Special "sour gas service" steel alloys have been developed to minimize pipeline embrittlement, a condition unique to sour gas. Isolation valves are installed at specified distances along pipelines to shut off sections of the line if leaks appear. Pipeline components susceptible to corrosion are coated with corrosion inhibitors. Some of the world's most advanced sour gas technology is being employed in Alberta.

But how does that relate to the fact that something can go wrong, as demonstrated by the Lodgepole blowout?

Said Harry Webber, Manager of the Gas Department at the Energy Resources Conservation Board (ERCB): "To me, sour gas is a deadly creature and if we rely solely on regulation and enforcement to protect the public, we're goners. But I doubt very much that half a million people living in and around Calgary lose much sleep over the fact that they are surrounded by sour gas facilities. The reason, I think, is because their number one protection is the ability,

# Alberta's Oldest Sour Gas Plant

PROVINCIAL ARCHIVES OF ALBERTA

In 1924, Royalite Oil Company built Alberta's first commercial scale gas processing plant at Turner Valley and from there supplied Calgarians with natural gas recovered from sour gas.

According to David Finch, an historical researcher whose postgraduate work at the University of Calgary centres on the social history of Turner Valley, people who lived in the area during the '20s, '30s and '40s used natural gas in their homes from which $H_2S$ had not been scrubbed. It fuelled their heaters, lamps and stoves.

If there were concerns about $H_2S$, they were secondary to the bleak economic circumstances most people found themselves in during this period. And if sour gas was a hazard it was because of its propensity to blow up buildings rather than poison people.

In his research, Finch attempted to determine whether $H_2S$ emissions were responsible for any health problems in that era.

"Hospital records have since been destroyed," Finch related, "and other statistical information made available to me was inconclusive. However, old timers I have interviewed scoff at the idea that the oil industry is harming the environment. They point out that lush vegetation now grows around the site of Royalite #4, a well that blew wild for three months in 1924. To them this is evidence that sour gas operations have no long term detrimental effects on the environment."

The original Royalite plant, which is still operating and has since been converted to a sulphur recovery operation, is owned by Western Decalta.

The Turner Valley Oil Field Society, which includes David Finch as one of its members, is presently lobbying industry and government to have the plant declared an historical site and turned over to the society so they can turn it into an exhibit.

— *R.C. MacKenzie*

GOVERNMENT OF ALBERTA

BILL MCKEOWN

Amoco Canada's sulphur plant at Crossfields

Liquid sulphur, Gulf's Strachen Plant (below).

sincerity and skills of the people in the sour gas industry to not have accidents. Industry people don't want to kill their fellow workers and fellow citizens. Everything the industry can do better is being tried, I think that's worth stressing."

The conversion of hydrogen sulphide to sulphur has made Alberta one of the world's major sources of this material which is in demand by fertilizer manufacturers. Of the 35 to 40 million tonnes of sulphur produced each year throughout the world, Canada's five million tonnes make this country the largest exporter.

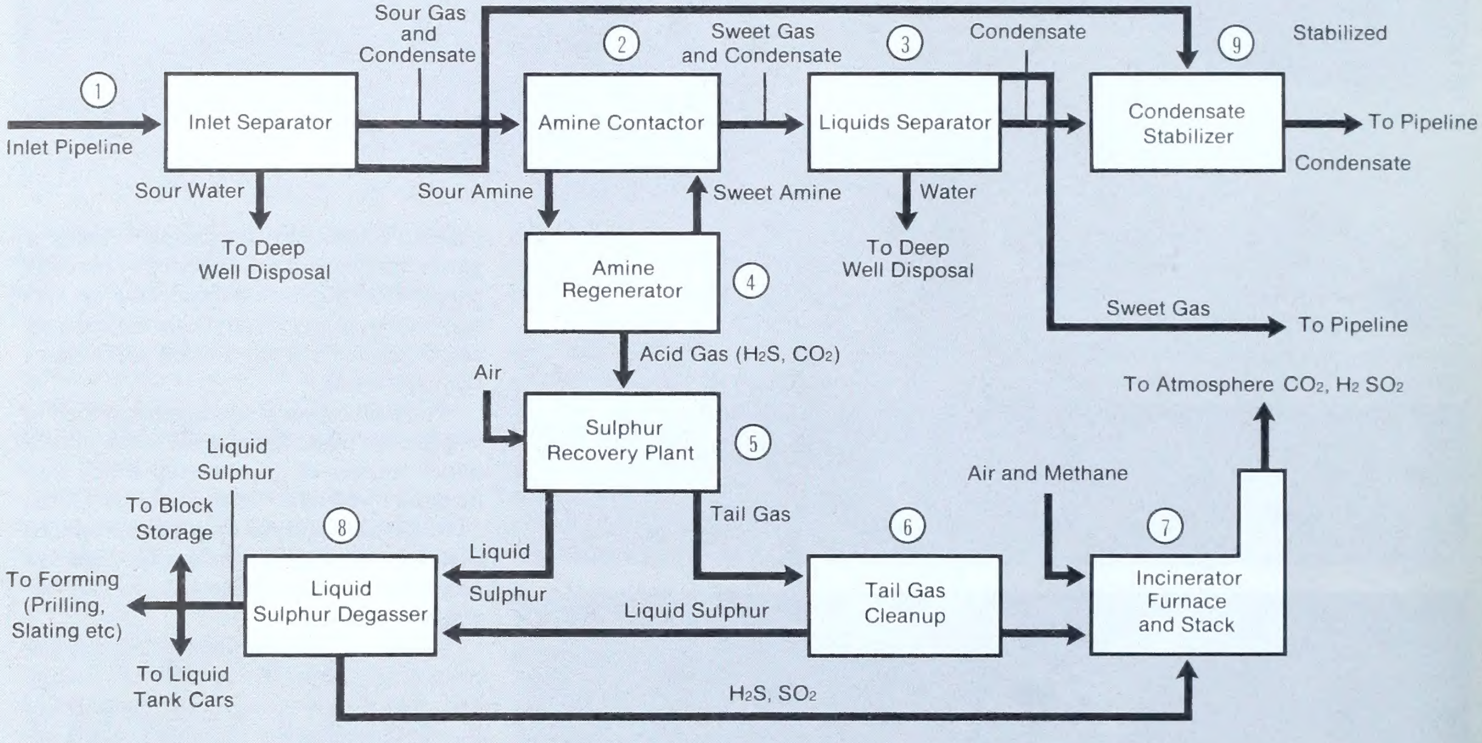
Sulphur production has become so important to Calgary-based Canterra Energy Ltd. that it now accounts for one-third of the company's profit. Canterra is also Canada's largest shipper of sulphur. During the first half of 1984 the company sold 928,000 tonnes of sulphur produced at its Ram River plant northwest of Caroline. The plant, at one time had a stockpile of sulphur 800 metres long, 300 metres wide and 15 metres high. Plant operators refer to their 24-hectare sulphur block as "Yellowstone Park".

Sour gas processed at the Ram River plant comes from 50 wells, located as far away as 120 km from the plant. To meet license requirements the plant must recover 98.4 per cent of all incoming $H_2S$ in the form of sulphur. What cannot be recovered is mixed with natural gas and then burned in an incinerator typical of types used in state-of-the-art plants. The resulting sulphur dioxide is expelled to the atmosphere via a 100 metre stack.

The science of sulphur recovery has advanced to the stage where the ERCB is presently reviewing Canterra's request to drill a well west of Sundre into a gas reservoir that is 90 per cent hydrogen sulphide. Clearly, the company is after the sulphur. If the well proceeds, it will be the first time ever that natural gas has been recovered at such high $H_2S$ concentrations.

R.C. MacKenzie is an Edmonton freelance writer and researcher specializing in science and technical writing.

# *The Sour Gas Processing Process*



①

### Inlet and Inlet Separator

Pipelines entering the plant transport methane ($CH_4$) and higher molecular weight hydrocarbons (condensates) water, hydrogen sulphide ($H_2S$) and carbon dioxide ($CO_2$).

The sour water is stripped from the inlet stream in the *Inlet Separator* and is disposed of by deep well injection. Most of the condensate is also removed at this stage and sent to the condensate stabilizer (9).

②

### Amine Contactor

The sour gas ($CH_4$, $H_2S$ and $CO_2$) and remaining condensate are fed into the *Amine Contactor*. The amine solution absorbs the $CO_2$ and $H_2S$. The $CH_4$ and condensates are not absorbed and are passed on to the *Liquids Separator* (3).

③

### Liquids Separator

The remaining condensate is removed from the stream by cooling or by desiccation. The separate streams of dried, sweet gas and stabilized condensate are shipped by pipeline from the plant. The sweet gas is primarily methane but at some plants there is sufficient propane, butane, etc. to justify their extraction.

④

### Amine Regenerator

Sour amine (containing $H_2$ and $CO_2$) is fed into the *Amine Regenerator* where $H_2S$ and $CO_2$ are separated from the amine solution. The regenerated amine solution (sweet amine) is fed back to the *Amine Contactor* for reuse and the $H_2S$ and $CO_2$ (acid gas) are sent to the *Sulphur Recovery Plant*.

⑤

### Sulphur Recovery Plant

In the *Sulphur Recovery Plant* the acid gas stream is preheated and one-third of the $H_2S$ is burned to form $SO_2$ which reacts with the residual two-thirds $H_2S$ to form elemental sulphur. This exothermic reaction is called the *Claus Reaction* ($3H_2S + {}^3/_2\ O_2 \dashrightarrow 3H_2O + 3S$). A variety of catalysts are used to make this reaction efficient; these include alumina and bauxite.

⑥

### Tail Gas Cleanup

The *Sulphur Recovery Plant* removes most (more than 95%) of the $H_2S$ by the Claus Reaction. Additional sulphur recovery is achieved by a variety of sub-dewpoint methods which convert more $H_2S$ to elemental sulphur. The additional condensed sulphur is combined with the sulphur from the *Sulphur Recovery Plant*, degassed (8) and poured to block storage, shipped in liquid tank cars from the plan or formed into slates, prills, etc. for shipment.

⑦

### Incinerator Furnace and Stack

The unrecovered $H_2S$, $CO_2$ and other gases are passed through a furnace where sufficient methane is burned to ensure complete conversion of $H_2S$ to $SO_2$ and to maintain a high temperature ( $>$ 500°C) to aid in plume rise and dispersion of effluent gases, from the *Incinerator Stack*.

*This diagram was prepared for Environment Views by Canterra Energy Ltd.*

Norma Ramage

# Sour Gas Technology

## Sweet gas from sour

An overview of Canterra's Ram River sour gas plant.

R.C. MACKENZIE

They are familiar sights in the Alberta landscape. Like 21st-century cities of gleaming steel and machinery, they stand out against the landscape, backdrops for a science fiction movie. Their 100-metre stacks stab the sky, the sun reflecting off the surrealistic mountains formed by the dazzling blocks of bright yellow sulphur.

But they're not futuristic cities, they are sour gas processing plants, multi-million dollar facilities whose primary purpose is turning sour gas into the sweet, marketable gas so vital to Alberta's economy. Their other purpose is to remove marketable sulphur.

About one-quarter of the province's producing gas fields are sour, some 3,400 wells. The Energy Resources Conservation Board defines as sour any gas that contains more than .16 moles of hydrogen sulphide ($H_2S$) to 1,000 moles of natural gas of .016 per cent by volume. However, any plant with an intake of less than 10 tonnes of sulphur is allowed to flare the $H_2S$ to produce sulphur dioxide ($SO_2$) and water.

***Reducing the amount of $SO_2$ emissions is one of the costliest aspects of gas processing and the area of greatest technological development.***

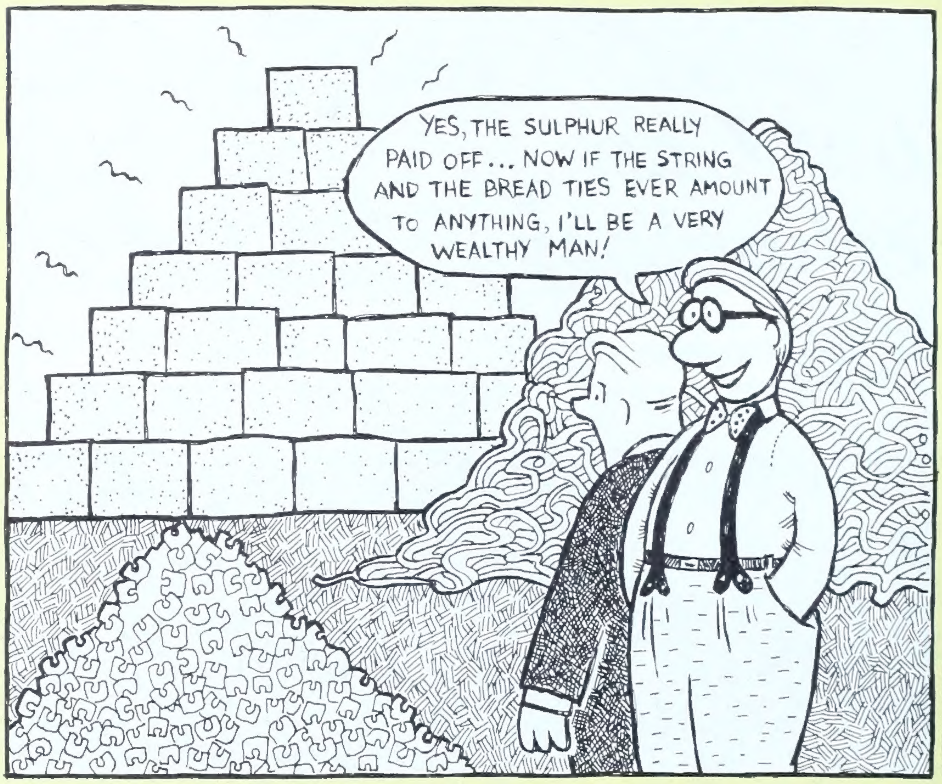
Sour gas isn't marketable as it comes out of the ground. Making it marketable requires the machinery of a gas processing plant such as Shell's Waterton plant or Canterra's Ram River operation.

The sweetening of the gas and the initial removal of the elemental sulphur is fairly standard throughout Alberta, explains Bill Schnitzler, an engineer with the ERCB.

"Plants all use the same basic chemistry and try to optimize it," says Schnitzler, assistant manager of the board's gas department. "There's no better mousetrap as far as the chemistry is concerned."

The equipment required to do this is as 21st century as the plant itself. But put in the simplest terms, the raw unprocessed sour gas, sometimes from as many as 32 individual wells, arrives at the plant and is "sweetened" or passed through an amine chemical unit which removes the sour gas and feeds it into the sulphur plant. There, a series of chemical reactions form the sulphur, and the residue or tail gas which contains sulphur dioxide and hydrogen sulphide is either processed again or emitted as stack gas through the plant's emission stack.

# *Sulphur Comes Into Its Own*



YES, THE SULPHUR REALLY PAID OFF... NOW IF THE STRING AND THE BREAD TIES EVER AMOUNT TO ANYTHING, I'LL BE A VERY WEALTHY MAN!

MARTHA JONES

Fifteen years ago, sour gas producers thought of sulphur as "yellow junk" they had to get rid off, sometimes dumping it on world markets for as little as $5 a tonne.

But today it's a different story. Sulphur is a valuable, marketable byproduct of the sour gas industry fetching over $70 a tonne with prices on the upswing. With depressed natural gas markets, sulphur has become sufficiently valuable that one of Alberta's major sour gas processors, Canterra Energy Ltd., has applied to open up gas fields near Sundre believed to contain over 90 per cent hydrogen sulphide.

"In the 1970s when wells were drilled in the Caroline and Panther River fields, they were capped because they were considered a failure," explains David McCoy, an environmental scientist with Canterra.

"But today, the price of sulphur is better and it's a sensible business decision to market the sulphur."

And it's a business decision that may find favor with more gas companies as prices, which plunged in late 1981 and 1982, are picking up, says Janet Terry of the Calgary-based Sulphur Development Institute of Canada.

"Right now, we're selling more than we're producing," says Terry, the institute's director of corporate and public affairs. "In 1983, we sold 6.2 million tonnes, close to the 1981 level of 7.7 million tonnes."

And good markets are more important to Canada than to most other countries because, between them, Canada and Poland produce two-thirds of the world's sulphur. And Canada means Alberta and specifically, the sour gas industry which accounts for 94 per cent of the province's sulphur production.

But depressed markets weren't the only reason gas producers didn't open up sour wells. One of the problems they faced was that the sulphur tended to precipitate from the hydrogen sulphide and clog up the system. Now, says McCoy, Canterra believes it has the technology to prevent this.

And, says McCoy, "With the new plants like Ram River, we believe we can economically remove 97 to 98 per cent of the sulphur compared to 90 per cent a few years ago."

The picture is also brightened by new uses for sulphur. Although 50 per cent of the world's production is still used for fertilizer production, says Terry, the industry is looking at some innovative new uses. These include using sulphur to extend or dilute asphalt, providing a more durable road surface, and developing a sulphur cement which, in some cases, may replace more traditional Portland cement. The Sulphur Development Institute has had good commercial success with both products.

But everything isn't rosy. The biggest problem may be producers' inability to meet new markets. Most new gas reserves discovered in recent years have been sweet gas. And apart from the Sundre-area fields, the only known major sour gas fields likely to come onstream in the next five years are the Blackstone and Moose Mountain-Whiskey Creek fields, says a report produced for the 1983 Alberta Sulphur Symposium.

The institute also estimates current Alberta sulphur reserves will likely be depleted by 1990 but oil sands developments, expected to provide a new source of supply, have been put on hold.

Despite this, however, gas producers are looking at their sour gas fields with new eyes and the one-time "yellow junk" may become a bigger part of their economic future.

— *Norma Ramage*

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But that's the simple explanation. The actual technology is complex and costly. It's also controversial because the unrecovered sulphur is emitted as $SO_2$, one of the main constituents of acid rain. In fact, reducing the amount of $SO_2$ emissions is one of the costliest aspects of gas processing and the area of greatest technological development.

All Alberta plants use a variation of the Claus thermal process to convert the $H_2S$ acid gas to sulphur. In this process, part the the $H_2S$ is burned to form sulphur dioxide and water. The sulphur dioxide then reacts with residual $H_2S$ to form elemental sulphur and water, with some of the $SO_2$ remaining as tail gas. The process is not 100 per cent efficient, so a portion of the total inlet volume is not recovered and is emitted as $SO_2$ from the incineration stack.

Plants use one, two or three-stage Claus units, with a three-stage unit capable of removing between 97 and 97.5 per cent of the sulphur.

But ERCB regulations may require more sulphur be removed to reduce the end amount of sulphur dioxide and in that case, a tail gas clean up (TGCU) system is required.

There are TGCU systems which can bring the sulphur recovery to as high as 99.9 per

**Joe Labuda**

cent. Perhaps the most effective, as well as one of the most expensive, is Shell's patented SCOT (Shell Claus Offgas Treating) process.

Shell added the SCOT to its massive Waterton plant giving it, according to Schnitzler, the best sulphur removal capability of any plant in Alberta.

"We routinely remove a minimum of 98.7 per cent of the sulphur," explains Chris Clarke of Shell's environmental affairs division. "And we usually recover a far higher percentage than that." According to Clarke, the SCOT unit at Waterton is capable of removing 99.9 per cent of the sulphur. Only one of Waterton's two gas plants is fitted with a SCOT because of cost. The other has no TGCU process and while the SCOT may remove 99.9 per cent, the combined removal rate may be lower.

During the 1960s the Waterton plants were emitting 200 tonnes per day. Now the average is about 30 tonnes per day, thanks to a better Claus process and to SCOT.

The SCOT process, developed jointly in the U.S. and Holland, uses a cobalt-molybdenum catalyst to remove sulphur and to re-form $H_2S$ which is then recycled back into the Claus system.

Its advantage, according to Shell officials, is that there is no secondary pollutant. Everything goes back into the system again. Its second advantage is that it uses an adaptation of existing facilities, as was the case in the Waterton plant.

Its main disadvantage, and one it shares with all TGCU systems, is that it is extremely expensive. Building it into a new plant would cost about 75 to 80 per cent of the cost of the Claus plant, says Peter Dickey, Shell's manager of environmental affairs. Retrofitting, or adding the SCOT to an existing plant, is even more costly. "Our rule of thumb is that adding the SCOT will cost the same amount as we spent on the original Claus plant," says Dickey.

This is because the system needs expensive compressors, the plant must be re-fitted to handle the extra $H_2S$ generated by the SCOT, people must be hired to operate it and the cobalt-molybdenum catalyst used in the process is fairly expensive.

Other TGCU systems operating in Alberta have similar price tags. For example, capital costs for some systems are as follows: Sulfreen process, 30 to 50 per cent of the parent Claus plant; Cold Bed Adsorption, 25 per cent of the parent Claus plant; Mineral and Chemical Resource Co. sub dew-point process, about 25 to 45 per cent of a two-stage Claus plant.

Costs vary depending on the size of the plant but a larger Claus plant may cost in excess of $25 million.

The SCOT and the similar Sulfreen process are the most efficient of the existing systems, but they're also the most expensive.

Explains the ERCB's Schnitzler, "Sulphur removal is a chemical process and to get any chemical process closer to perfection costs a lot of money. The last 2.1 per cent is much costlier than the preceeding 2.1 per cent."

***"If you ask for 100 per cent recovery then you might as well ask to shut down the sour gas industry."***

And it's here that gas companies and members of the of the public concerned with the impact of $SO_2$ emissions collide head on. Environmentalists and the public demand the companies remove 100 per cent of the sulphur and eliminate the $SO_2$ being pumped out of gas plant stacks. But the companies say they just can't afford it, and it is generally believed that 100 per cent removal is physically impossible.

"If you ask for 100 per cent recovery then you might as well ask to shut down the sour gas industry," says David McCoy, an environmental scientist with Canterra Energy which, with Shell, is one of the province's two biggest sulphur producers.

Industry experts say getting those extra few percentage points is a logarithmic progression. Each percentage point of removal is increasingly more costly than the percentage point immediately before.

While newer plants using state-of-the-art technology may have recovery rates in the 97 to 99 per cent range, retrofitting older plants to reach that figure has been extremely expensive. In addition, says Schnitzler, smaller plants with a smaller sour gas feed or processing gas with a lower concentration of $H_2S$, cannot reach such a high recovery percentage. The larger the amount of gas going through and the greater the $H_2S$ concentration, the more efficient the chemical reaction.

An ERCB report presented at an environmental conference in Edmonton in October 1982 estimated, "The incremental unit costs of recovering additional sulphur for any plant group is a minimum of $1,000 per tonne and averages some $2,000 per tonne for . . . 1982 best available technology." Sulphur sells today for an average of $70 a tonne.

Schnitzler estimates that in most plants, only the first 90 per cent of the sulphur is worth taking out just for the money and "after that there is a diminishing return on investment."

But Joe Labuda, of Environment Canada's environmental protection service in Ottawa, says getting higher sulphur recovery isn't as expensive as industry figures indicate. The key, says Labuda, lies in the difference between incremental and total costs.

"They work out the costs incrementally and that way it's expensive. With incremen-

SUSAN BRUN

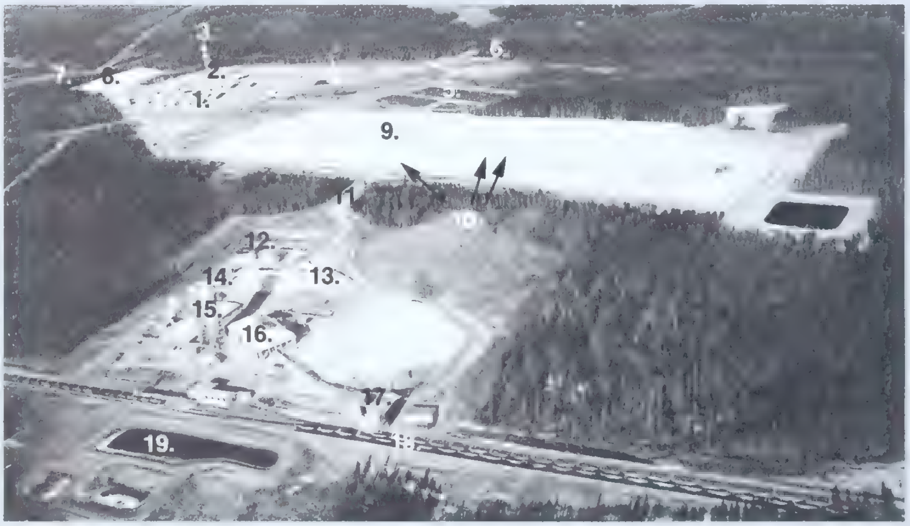
Shell Canada's Waterton sour gas plant.

Canterra Energy Ltd's Ram River Plant (below).

tal economics, you can prove anything you want."

Instead of just assessing what it would cost to get additional sulphur and charging the cost to the sulphur recovery, says Labuda, energy companies should be applying the cost of tail gas cleanup to the total profit picture.

"After all, the sulphur is being removed to get saleable gas, so the cost of sulphur removal should be charged to the gas, not just to the sulphur. You have to look at it as a cost of doing business and for that you must add in the gas income."



PLANT PROCESSING AREA

1. gas treatment area
2. sulphur recovery section
3. incinerator stack
4. flare stack
5. wastewater retention and treatment ponds
6. sales gas and liquid hydrocarbon pipelines
7. sour water pipelining to deep well injection site

SULPHUR STORAGE AREAS

8. small sulphur block
9. large sulphur block
10. ellitharpe remelters (liquefying the sulphur)
11. liquid sulphur pipeline
12. liquide sulphur storage tanks
13. contaminated sulphur pile (soil and sulphur)
14. contaminated sulphur reclaimer

SULPHUR HANDLING AREA

15. prilling tower
16. open storage pad
17. load out tower
18. sulphur unit train
19. pond for handling area runoff

Labuda estimates that to get a plant like Quirk Creek or Jumping Pound to 99 per cent sulphur removal would increase product revenues by three per cent. So, says Labuda, "the cost for pollution control is small in the total picture."

But gas companies don't agree. However, says Shell's Clarke, money or not, the industry would be willing to put in the extra system if there was a proven need for it. "We'd need to see a negative environmental impact as a reason to do it," says Clarke, "and so far that simply isn't there."

He points out that every gas processing plant in Alberta meets and usually exceeds sulphur removal requirements set by the ERCB. Monitoring done by industry and by government simply hasn't shown any existing problems that would require something like a SCOT unit in every plant.

Labuda agrees gas companies meet the ERCB's standards but argues they should go further.

"They've reached the point of economy and they didn't go beyond. They are good corporate citizens and they meet the laws but they don't go forward.

"It's all bucks. Why do something when you don't have to and you can use the atmosphere as a dispersant? No one is willing to be the first in line to go further."

The ERCB's Schnitzler agrees the technology is there to remove all but the smallest amount of $SO_2$, at least in big, modern plants such as Shell's at Waterton. "If you were to assume money wasn't an issue, you could put SCOT on most plants and get 99.8 or 99.9 per cent."

However, Peter Dickie of Shell's environmental affairs branch says there's more than just money involved, there are also environmental costs.

"With some of the simpler, first generation systems such as line scrubbing, for example, there is lime sludge to dispose of.

"And then producing power usually means using coal which in turn means $SO_2$ emissions and environmental damage from strip mining."

Canterra's McCoy agrees: "If I use a large amount of electrical energy what am I putting into the atmosphere in terms of $SO_2$ and nitrous oxide to get increased sulphur recovery? There's no such thing as a free lunch environmentally. There's always a trade-off."

He also points out that ERCB statistics show that province-wide, gas processing plants remove an average of 97 per cent of sulphur, an amount that will get higher as new, high tech plants like Shell's Waterton and Canterra's Ram River become the norm.

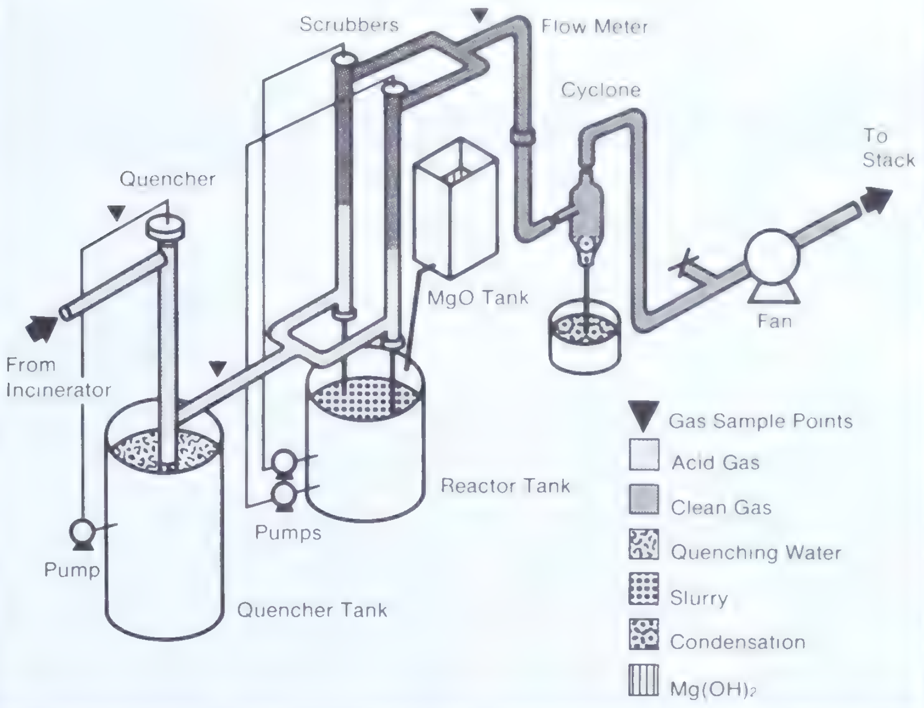
Until then, the ERCB appears content with the level of sulphur removal technology being practiced in provincial gas processing plants and with the industry's record of reducing sulphur dioxide emissions from a 1972 peak of 530,000 tonnes annually to 250,000 tonnes in 1982.

Says Schnitzler: "What we want is to get a high recovery rate and low pollution rate but in a way that doesn't break industry's piggy bank."

Norma Ramage is a Calgary journalism instructor and freelance writer

# New Developments

WET SCRUBBING SYSTEM FOR STACK GAS CLEANUP



DEVELOPED AT THE ALBERTA ENVIRONMENTAL CENTRE

If a new stack gas cleanup system being developed in Alberta works out, environmentally-dangerous sulphur dioxide emissions from gas plants will become a thing of the past.

That's the enthusiastic belief of Dr. Sherman Weaver, head of the Alberta Environmental Centre (AEC), the organization developing the system expected to remove 95 per cent of sulphur dioxide remaining *after* tail gas cleanup.

But this exciting project is only one of many technological advances being made in sour gas processing. Another is an amine absorption unit that will mean substantial savings to the industry, according to its patent holders, Alberta Helium Ltd. of Calgary.

It would take an entire magazine issue to even skim the surface of all these technological advances, but the two mentioned are not only state of the art technology, they're also local and most importantly, they represent distinct thrusts in research and development.

The system developed by Alberta Environment's research centre, as might be expected, is primarily an environmental protection device. Any dollars that are saved are simply an unexpected bonus.

Alberta Helium, on the other hand, says frankly its system is designed purely and simply to save money.

Neither system uses new technology but the applications are innovative and unique.

Dr. Malcolm Wilson, head of the AEC project, says the system uses a modified magnesium oxide scrubbing system already in use in coal-fired power stations in the United States, but never used in a gas processing plant before.

"We take what's left after tail gas cleanup and we can easily remove 95 per cent of sulphur dioxide and in some conditions, if we're willing to spend the money, we can remove it all," says Wilson.

"So, if the environmental consequences of gas processing are due entirely to $SO_2$ and not to some other, unidentified contaminants, then I think that if the system works we can eliminate those environmental problems."

The stack gas cleanup process, which has already undergone a successful field test at Gulf's Nevis plant, has the advantage of being easy to operate and also of saving the gas company some money.

Plants will no longer have to build 100-metre stacks and expend energy to heat the gas and drive it up into the atmosphere, says Wilson. In addition, the magnesium oxide used in the process is now relatively inexpensive.

"We used to have to bring it in from the United States so transportation made it expensive. Now there's a magnesium oxide operation right here in Alberta at Exshaw."

A final advantage is that the system will provide marketable byproducts in the form of magnesium sulphite and various magnesium salts.

All that's needed now, says Wilson, is a long-term field test.

"There are always unanswered questions and we won't know if the system will work until we test it at a pilot plant for a year."

However, the federal government and the energy companies have indicated an interest in the system and Wilson expects the technology could be on the market within two years.

Alberta Helium is also looking some way down the road for its new technology, says company president J.E. Baugh, but he too is optimistic about its success.

Although he said he could give no figures until the system had been field tested, Baugh thought the amine absorption process would save gas companies enough in energy and operating costs to make retrofitting worthwhile. "And we think we'd be a part of any new plant."

The system uses technology developed by the Alberta Research Council under contract to Alberta Helium. It was originally developed as a means of extracting helium from natural gas but when the helium market softened, Baugh started looking for alternate uses for it.

The system is basically a membrane that works on the theory that molecules of some substances are absorbed faster than others. The Alberta Helium membrane, made from fibres manufactured in Japan, would be set up to take the gas before it reached the amine bed, says Baugh.

"Not all the $H_2S$ would be absorbed by the membrane but we'd get a lot of it out of the gas. Then it would fed into the Claus system."

Although this wouldn't mean totally replacing the amine bed, says Baugh, it would mean a smaller amine bed with the consequent saving in energy costs.

"Ours is such a simple, low cost system. There's very little energy involved. No pumps, no circulation, no moving parts. You just set it up and forget it."

It is also simple to operate, says Baugh, and would not mean re-training personnel or hiring extra operators.

Alberta Helium is now negotiating with a gas company to field test the system.

— *Norma Ramage*

Jim Wilson

# Environmental Impacts

## Some are proven, some suspected

Shortly after the end of the Second World War, fruit growers in the Wenatchee Valley of Washington State launched formal complaints against the Consolidated Mining and Smelting Company (now Cominco) smelter in Trail, B.C. Their entire valley, they said, was dying because of pollutants coming from the smelter's smokestacks.

They won their point: north of the Trail smelter the Columbia River valley was verdant; inside and to the south of the community it was parched and lifeless. The source of the problem was easily identified — and the company conscientiously installed equipment to clean up its emissions. The valley came back to life.

Unfortunately most pollution problems are not nearly so easily solved. And when it comes to the concept of *health* impacts which may have been created by pollutants the complications become horrendous.

And perhaps the most distressing reality is the fact that there is virtually no sound body of knowledge concerning impacts on either people or the environment from prolonged exposure to small amounts of many pollutants.

There is no question that $SO_2$ plant emissions and accidental release of $H_2S$ gas (hydrogen sulphide, the component which makes some natural gas "sour") can be dangerous to human and animal health and to the environment; indeed relatively small amounts of either gas, on the order of 600 parts per million, can rapidly be fatal. There also is no doubt that $SO_2$ emissions are a significant source of acid deposition on the world landscape.

But the question of "how much" is the difficulty. How much is dangerous, and how much is simply annoying? There were no deaths or serious illnesses among residents in the vicinity of the recent Amoco sour gas well blowout near Lodgepole, for example, where raw $H_2S$ gas was released and concentrations of up to 30 parts per million were recorded, although in the nearby communities of Lodgepole and Cynthia concentrations appear to have been under 20 ppm. There were, however, some temporary af-

Sulphur gas plant, Rocky Mountain House area

***The impacts of sulphur gas exposure, then, are to some extent in the eye of the beholder.***

fects on asthmatics and others, and some considerable stress to the environment.

"If you don't feel well and you don't know why, you look around for the cause of it — it makes you feel a bit better if you think you at least understand *why* there's something wrong," says Ken Smith, Alberta Environment's assistant deputy minister for environmental evaluation services. "And when enough people identify the same causal link — the nearby sour gas processing plant for instance — it becomes part of the community's belief structure, even if it's only based on assumption."

The impacts of sulphur gas exposure, then, are to some extent in the eye of the beholder. Some are provable; most as yet are not. And they extend beyond human health considerations to environmental, agricultural and even equipment corrosion problems. But in the list that follows it must be noted that these indeed *are* perceived impacts — they are not *proven* impacts and in fact some are highly unlikely.

Among *perceived* health impacts are nosebleeds, colds, headaches, nausea, diarrhea, sore eyes and even cancer. In addition there is the fear of a well blowout similar to Lodgepole, a break in a pipeline which could spill out deadly $H_2S$ gas, or a similar occurrence in a processing plant.

The general environment in Alberta seems less affected except in the immediate areas of those enormous yellow sulphur blocks, processing plants or the site of a well blowout. Nevertheless, suggested impacts include acidification of soils and a general difficulty for vegetation to thrive in this acid-enriched environment. (Sulphur dioxide combines with water in the air or on the ground to create a mild acid.) There has been one suggestion in Alberta that the gas reduces the ability of vegetation to absorb selenium, but this has not been observed elsewhere.

There is also some environmental concern about potential acidification of streams and lakes in the province, and possible future danger to northern Saskatchewan when Alberta's oil sands are eventually developed.

BILL MCKEOWN

**Ken Smith**

Since heavy metals in trace quantities are found in natural gas elsewhere in the world there is concern that these could be emitted through flare stacks in Alberta. People have also expressed fears that dioxins, hydrogen cyanide and a variety of carcinogenic substances could be created and released into the atmosphere. In this respect a preliminary Alberta Environment-ERCB study has shown that traces of such substances in stack emissions are so minute that they could not cause any damage. However, the study has four years to run yet, and its officers refuse to draw any conclusions until it is finished.

Agricultural concerns include soil acidification, particularly in the Peace River area where it is already too acid for efficient cropping, and livestock diseases caused by the lack of selenium in their forage food. In cases where processing plants are on or near agricultural land farmers worry that harmful pollutants might be released into local groundwater.

And finally, sulphurous compounds are known to be corrosive, so there is concern that flare stack emissions or sour gas leaks will harm farm equipment and wire fences.

With all of these feared impacts it's no wonder that people are less than enthusiastic about energy company proposals to build new sour gas plants or drill new wells or lay new pipelines, even though there are few examples of direct harm from them or evidence to support the long list of worries.

"I think the most frequent message we hear from the public concerns impacts on human health," says Gerry DeSorcy, vice-chairman of the Energy Resources Conservation Board, which must approve all such projects and which holds public hearings into every application.

"The two situations intervenors generally address at our hearings are firstly the possibility of high levels of a dangerous pollutant being released over a short period of time such as happens in a blowout, and secondly that even if there's no blowout, what the results might be of exposure to low-level emissions over a long period of time."

Having those concerns and asking them of energy company applicants is reasonable, DeSorcy says, but he worries about the negative feelings that can result when the project is approved and goes ahead despite such public reservations.

"Sometimes there is simply no provable, justifiable reason to refuse an application," he says. "It's our job to weigh all the provable benefits and disbenefits of the application, and to make certain that all legislated standards are met. We have no legal jurisdiction in matters of compensation (the province of the Alberta Surface Rights Board)

# The Pincher Creek Story

SUSAN BRUN

**Sophie Taylor**

If you live on an island in the South Pacific and wake up one day with nausea, a headache, sore eyes and a feeling of congestion, you'll think you have a touch of flu or you're getting a doozy of a cold — what else could it be?

But if you live near something like a sour gas processing plant there's a good chance you'll associate the unpleasant illness with the unpleasant odor, and place the blame there as well.

Therein lies the thorniest problem faced by both the sour gas industry and the government bodies that regulate it, because symptoms of exposure to sulphur dioxide (the end-product emission of sour gas processing) are similar to many common maladies, so there is a danger that symptoms of an identifiable medical problem may mask indications of sour gas exposure — and vice-versa.

Alberta's Pincher Creek area is perhaps the best example of such an issue in Western Canada, and it is to be the location of the first major medical diagnostic study associated with the recently-initiated seven-year Acid Deposition Research Program (ADRP), co-funded by industry and the Alberta government. Until recently the region has been the location of two neighborhood gas processing plants.

The Pincher Creek area was considered by the ADRP human health workshop of internationally-reputed scientists to be the most urgent site for a medical study, both because there is already a substantial body of information about problems in the area and because, as the workshop experts state in the introduction of their report, ". . . public complaints of health problems are a valid starting point" for any human health studies related to acid deposition.

"Studies in the Pincher Creek area are nothing new," says Dr. Bob Rogers, government co-chairman of the human health section of the program. "But this particular study will try to focus on the medical aspects of the issue, and we hope to be able to find concrete evidence one way or the other to show whether there has been a human health problem created in the area by gas processing emissions.

"What we have to know there is whether there *is* a problem, not simply whether there *could* be a problem. We have to find out if there's a real medical problem, or a perceived medical problem, or a combination of the two — and in that case the magnitude of each part."

Public concerns in the area began shortly after Gulf Canada opened a sour gas plant in 1957. Whenever the wind was right — or wrong — residents were inundated by the familiar rotten egg smell associated with sour gas. Four years later Shell Canada opened a second plant in the area, five times larger than the Gulf facility, and the health problems people attributed to gas plants skyrocketed. Residents attributed a multitude of maladies to the gas plants, ranging from simple nausea to chronic colds and even cancer.

During the next two decades eight studies were completed in the area; none provided results that were sufficiently complete or definitive to prompt mitigating action by industry or government.

"I think the main problem in the past has been that they were studying little bits and pieces here and there, without any real organization to it," says Sophie Taylor, president of the Pincher Creek Area Environmental Association. "There wasn't very much input from people who believe they are the victims of the pollution.

"But before ADRP was started our association made quite a number of recommendations to SCAGE (a joint industry-government Steering Committee on Acid Gas Emissions whose report resulted in ADRP's creation) and I see quite a few of those in the new study. If it goes ahead the way they say it will, it looks like the best thing that's ever been done here."

Taylor, a Pincher Creek rancher, says people in the region are "watching very carefully", but are enthusiastic about the potential of the ADRP medical diagnostic study. The initial investigation, involving interviews with area residents, will be funded by a special $150,000 grant from Alberta Environment and Alberta Social Services, quite apart from the main ADRP budget. If the results identify the problem areas many expect they will, more detailed studies are likely to be funded by the program's own budget.

People working on the ADRP are also optimistic about the study.

"Our first step was to hold three public meetings, in Twin Butte, Mountain View and Glenwood-Hill Spring," says Kerry Lowe, community impact co-ordinator for Alberta Environment in Lethbridge. "We described to the residents what we hoped to do in the study, and asked for their assistance. They expressed a certain amount of caution, but so far there's been lots of co-operation from them."

The next step, in July, was a public meeting of area residents with a six-member panel of internationally-known medical scientists during which the panel got to know the people, and collected suggestions concerning specific health problems and other issues which could be addressed.

and no legal jurisdiction to refuse a project simply because people are afraid of what *might* happen."

Alberta Environment's Ken Smith sympathizes. "Our ability to detect and measure the low level of emissions (of such things as hydrogen cyanide or heavy metals) involved is very recent," he says. "We didn't even know the compounds were there. The result is that no one has done any substantial toxicological research on the emissions and no one really knows what the effects of prolonged exposure will be — or if there will even *be* any effects.

"If you look at what we do know there's little strong evidence of most of the things people are worried about in the long-term sense. On the eastern seaboard where the concerns over acid rain began no one has identified any impacts in terms of human health. And in New Zealand where there is a natural occurrence of (some of) the same compounds and a long history of human and environmental exposures to them, there are no apparent implications in the health of the people who live there or their environments.

"But all this really proves is that either there's nothing there, or that we're simply not looking hard enough."

Smith adds that sour gas should really be considered as only one of a number of chemical contaminants to which the environment is exposed. "We don't have much knowledge of the long-term effects of so very many contaminants," he says. "This is simply one of them that has been singled out."

Charlene Currie, a member of the Red Deer Regional Planning Commission, has attended a number of ERCB hearings involving sour gas applications. And evaluating the evidence presented is "like looking through a fog," she says.

"When interveners ask an applicant company what the impact of some compound will be, too often the answer is 'minimal'. But 'minimal' means different things to different people. What's minimal to a company may be really significant to an individual. And even if there's only a minimal impact on the soil or a river or lake, it may still be sufficient to cause an environmental problem over a longer period.

"What concerns me most is that everyone involved has different interpretations and different evidence and opinions. Interveners contradict each other and companies contradict each other and the two sides certainly contradict each other.

"It's a problem," Currie observes, "that's not going to go away."

The gas processing industry insists it is approaching the problem as a good and concerned corporate citizen should.

"For any major gas plant development we do a full-scale baseline study to establish the existing state of the environment before the project begins," says Millard Wright, manager of environmental planning for Gulf Canada. "This can be part of the Environmental Impact Assessment required by Alberta law, but it's in our best interests to do it in any event because it's important that we know going in what might happen.

"We take the baseline data and with the help of a computer we superimpose the development on it so we can predict the impacts. This is done early in the planning stages, and in some cases we can see there are impacts which could very definitely harm the local environment and we can easily take steps to avoid them or at least to lessen them to the point that they're under control.

"Unfortunately there can be other impacts that are more subtle, and that's where the controversies begin," Wright says.

"That still leaves us all not knowing quite how to solve the problem of public concerns. I think the industry tries conscientiously to meet all of the standards required of it. But it's quite possible that there are people who are supersensitive to things in the air, whether it's pollen or gas plant emissions. And there's always the potential for an accidental release of hydrogen sulphide or sulphur dioxide. If a plant is there long enough there's even the possibility of a larger uncontrolled release.

"But what's the *likelihood* of that occurring? What's the *likelihood* of the supersen-

Further steps include developing a request for proposals to be sent out to scientists and consultants who will be invited to suggest ways the actual study can be carried out, and selection of a principal investigator, possibly by the end of this year. More public meetings would be scheduled for February of 1985, and then during March and April the investigators would conduct individual interviews with a large sampling of people in the region.

A report would then be prepared for review by an outside scientific advisory group, and the final report submitted to ADRP by the end of the summer. This report, it should be noted, will provide a substantial record of problems people *perceive* to be related to sour gas plant operations, and their evidence for those beliefs. It will take a further ADRP study, not yet scheduled, to actually prove such links.

Martha Kostuch, the public representative on ADRP's members' committee, says she is pleased with the design of this preliminary study. "It's similar to one we recommended several years ago, but it's even more extensive. We've needed an integrated study in the area for many years, and I'm relieved that we finally seem to have one that will provide the information we've all been looking for."

Meanwhile, the sour gas situation in the area has changed somewhat. The Gulf plant has been shut down and the land purchased by a firm which plans to build a fertilizer plant there. The gas which would have been processed there is being piped to the nearby Shell plant.

Gulf spokesman Millard Wright says his company has no vested interest in the study, "but as a corporate citizen deeply involved in the area we're interested in the study and its results." And Ken Dickie, Shell's environmental co-ordinator at its Waterton plant, says that while Shell also has no direct participation in the study, "we've always been supportive of any medical studies that have gone on in the community and we feel the same about this one."

Sophie Taylor hopes this will be the last such preliminary study.

"Company and government officials must be really tired of this issue, and I'm sure they'd like to solve the problems and see the issue end. There are a lot of people interested in this study, and since it's part of ADRP it will get pretty broad publicity. So I can't see it dying, or the report simply being shelved.

"This time," she says, "I think we've got something good."

*— Jim Wilson*

sitive individual actually suffering medically? I don't ask those questions lightly — we certainly have to be concerned about them, and about the other questions in the public mind."

Safeguards are taken, both through ERCB and corporate action. Gas pipelines have shutdown valves at regular intervals which close automatically if there is a breach in the line, thus limiting the quantity of gas released. Similar safety features exist in gas plants, including the automatic flaring of $H_2S$ gas. Even before the Lodgepole blowout there were many safety regulations concerning drilling activities and these have been substantially beefed up.

Alberta Environment operates numerous monitoring stations throughout the province for the ERCB to check the air for illegal emission levels, and has a number of mobile units and investigatory teams which take action when a pubic complaint is received.

When the ERCB receives a complaint from the public it is acted on immediately. Similarly, if a public complaint goes to Alberta Environment it is immediately passed along to the board. Field officers investigate the problem, and contact the offending company as soon as it is identified. If a source is not immediately obvious the ERCB or, at its request, Alberta Environment will send out mobile monitoring units, sometimes even locating one on the complainant's property until the odor's origin is found.

At that point the board informs the company involved and asks it to submit a plan for solving the problem, generally also setting it a deadline. The ERCB has the authority to shut the offending operation down if necessary — and on occasion has done so. It will also levy fines if such action is indicated, although this rarely happens — a source of some criticism from environmental groups.

The board also keeps the complainant informed at each step of the process. And if the complainant is unsatisfied with either the board's handling of the problem or its solution, the matter can still be appealed to Alberta Environment.

The companies themselves also act quickly when a problem is identified — although this may happpen more frequently when the problem is extremely public.

The Canterra Energy Ltd. sulphur block at its Ram River plant is the largest such block in North America. Since sulphur prices and demand have improved on the world market, the company has been melting part of the block down for sale. And earlier this year it caught fire, burning for 6½ hours and oxidizing more than 10 tonnes of sulphur into $SO_2$ gas.

SUSAN BRUN

**Millard Wright**

The fire was a freak occurrence caused when a number of unlikely events all happened at once in a perfect example of Murphy's Law. Sulphur blocks are constantly sprayed with water to minimize fire danger. However, on the day in question unseasonal Chinook winds were evaporating the water almost as fast as it was sprayed on. A tracked backhoe working on top of the block was crossing it for refueling. Rocks in its cleats created sufficient friction to cause sparks — and the abnormally dry sulphur caught on fire.

Teams were sent out immediately to control the fire; sulphur usually burns very slowly, but the high Chinook winds fanned it quickly into a much larger blaze (eventually a surface area of more than 3,800 square metres burned). The block's only access ramp, which normally could have been used to bring in heavy equipment, was unfortunately the location of part of the fire because that's where the backhoe had been headed. Water bombers were called in; however, they couldn't take off because there was no wind where they were based — and the airport was fogged in.

Canterra had been taking all the standard safety precautions for a sulphur block operation, but the fire started anyway, through no fault of the company's. Canterra and the industry — learned from the event, just as they learned from the Amoco Lodgepole blowout. In both instances new and much more stringent procedures have been adopted.

Fortunately environmental damage was minimal and was limited to the immediate area, and no one was seriously injured. Nevertheless, this experience, the Lodgepole blowout and the continued publicity generated by very concerned people in the Pincher Creek area illustrate why industry and government, as well as the general public, remain concerned about the potential impacts of sour gas and why people living near proposed plants or pipelines continue to ask questions about impacts at ERCB hearings.

For answers, we may have to wait for Alberta's joint government— industry seven-year, $8 million Acid Deposition Research Program to present its findings in 1991.

Jim Wilson, a former journalist, is a Calgary freelance writer.

Gillian Sniatynski

# *Regulating the Industry*

## A shared responsibility

BILL MCKEOWN

Regulation of any industry involves weighing benefits and costs.

In the gas industry, where the ERCB estimates one in four Albertans directly and indirectly make their living, the benefits are obviously substantial.

The costs — especially where they concern intangibles like environmental quality — are much harder to compute. Until recently, most Albertans were content to let the appropriate government agencies worry about environmental quality, and regulate the industry accordingly.

Today, those same agencies — Alberta Environment and the Energy Resources Conservation Board (ERCB) — consider they've done a pretty good job. They have adopted the most stringent air quality standards in the country, and their enforcement policy routinely achieves a very high level of industry compliance. What more could anyone ask?

But Albertans have been sensitized to the potential environmental impacts of the sour gas industry by events like the 1982 blowout of the Amoco sour gas well at Lodgepole, and by Pincher Creek residents' attempts to link their ongoing health problems to the neighboring sour gas plants. There have also been growing fears about the effects of acid rain.

***Until recently, most Albertans were content to let the appropriate government agencies worry about environmental quality, and regulate the industry accordingly.***

This heightened concern has led to a lot more questioning about how the industry as a whole is regulated, with regard to such issues as safety and environmental impact.

The process begins with the setting of objectives. Environment Canada has identified three levels of air quality: "maximum desirable", which is the long-term goal for air quality, providing a basis for an anti-degradation policy for the unpolluted parts of the country" and the continuing development of control technology; "maximum acceptable", which provides "adequate protection" against adverse environmental effects; and "maximum tolerable", denoting concentrations needing reduction without delay.

The most stringent, the "maximum desirable" levels, are the ones Alberta Environment has adopted for some pollutants. What this means for the sour gas industry is that the air around a plant must contain no more than 0.17 parts per million of sulphur dioxide ($SO_2$) over a one-hour period. (The

Stack sampling of incinerator stack (Page 19 top)

Cracking tower, Gulf's Strachen Plant (Page 19 below).

BILL MCKEOWN

**Bob Briggs and Jerry Lack**

Ontario limit is 0.25 ppm. Manitoba's limit — equivalent to Environment Canada's maximum *acceptable* level — is 0.34 ppm.)

The height of the stack used to disperse plant emissions is one way to control how much of any pollutant will affect local air quality. But it certainly can't be the only way. ERCB chairman Vern Millard notes: "Construction of superstacks results in the broad dispersion of effluent in the atmosphere thereby permitting local air quality standards to be met but causing problems in other areas."

In Alberta, sulphur recovery requirements set limits on the amount of $SO_2$ remaining to be dispersed through the stack of any plant. (Those recovery rates, too, have been made more stringent as technology has improved over the years. In 1961, the recovery rate specified was about 90 per cent. Now, it's closer to 98 per cent.) And stack height is determined by Alberta Environment by means of a computer model which takes into account local meteorological conditions, terrain, existing sources of pollution in the area, and the amount of effluent to be dispersed.

> ***"Construction of superstacks results in the broad dispersion of effluent in the atmosphere thereby permitting local air quality standards to be met but causing problems in other areas."***

Making sure the standards are met is a responsibility shared by Alberta Environment and the ERCB. Actual plant operations, for example, are the concern of the ERCB. It receives monthly reports from plant operators which record among other things the volume of sulphur contained in inlet gas, volumes recovered as elemental sulphur and the volume discharged to the atmosphere as $SO_2$. ERCB field staff check the reports and follow up problems on the plant site.

The purpose of the objectives, however, is the preservation of air quality. Actual air quality measurement is done by continuous recording monitors, which Alberta Environment requires each major sour gas plant to install at locations designated to represent "worst case" air quality conditions. Printout data from the recorders must be filed monthly with Alberta Environment, and readings that exceed the standards are investigated. Small plants are required to monitor less frequently.

The department also runs a "data quality assurance" program, periodically checking data collection equipment and conducting random comparison tests — to ensure that the industry's self-monitoring is reliable.

As well as the regular monthly reports, operators are required to notify Alberta Environment of any violation of standards specified for their plants within 24 hours of its occurrence, and submit a detailed follow-up report within 72 hours.

Although primary responsibility for enforcement rests with the ERCB, Alberta Environment is also very involved. The basis of the enforcement program, notes the department's pollution control director, Bob Briggs, is "the premise that environmental protection can best be achieved on the basis of co-operation and negotiation between government and industry."

"Companies have to realize that the department is serious about ensuring compliance with the acts, regulations, licences and guidelines," he adds.

"However, companies will be given a reasonable opportunity to comply with the requirements."

According to Jerry Lack, head of Alberta Environment's air quality control branch, the department evaluates any violation in the light of many factors including the following:

- the cause of the violation;
- plant operations;
- the environmental consequences of the violations;
- the frequency and duration of violations;
- the degree to which the standard was exceeded.

The assumption is that violations are rarely the result of gross negligence or a willful disregard for the environment. They are more often caused by adverse meteoro-

Inside Environment's mobile lab

logical conditions, mechanical breakdown, plant start-up or shut-down, or "debugging" of new equipment.

In the light of this review, the department then implements any one of a hierarchy of enforcement measures.

The first, preferred step is to work with the company to resolve the problem. The second involves meetings with company management to resolve problems, *and* the issue of an air quality directive (accompanied by a news release) from the director of pollution control.

The third step (implemented if industry response is unsatisfactory) is the emission control order — again accompanied by a news release. The control order is a legal — and totally enforceable — document telling the company what is expected of it within a given time.

"If the company does not comply with the control order, the co-operative phase is ended," Lack says.

"The options are court prosecution or a ministerial stop order. Ministerial stop orders are generally issued only if a company is extremely unco-operative or if there is immediate danger to human life or property, or both. In a stop order, the company may be ordered to cease a contravention or stop an operation."

In fact, there have been no stop orders issued in the sour gas industry in Alberta.

"Alberta Environment believes that in most cases it is not productive to enforce through the courts. Court action is time-consuming and costly and while the court case drags on, the violation may be continuing. It has been the department's experience that enforcement can be achieved most effectively through technical discussions rather than reverting to an adversary system. However, if there is a need we'd recommend prosecution to the attorney-general."

Department officials believe the statistics testify to the system's success. In June, for example, ambient monitoring records showed a 99.89 per cent compliance rate.

There is certainly industry support for the department's approach.

Millard Wright is manager of environmental planning for the development division of Gulf Canada Resources Inc., and he chairs the Canadian Petroleum Association's environmental research advisory council.

"Alberta Environment's philosphy of trying to work more with industry, to achieve good air and water quality through a negotiation approach implemented over various stages is going to get far better results than one based on fines, tickets and so on," he says.

"We need prosecution from time to time, but not to the extent some public interest groups suggest."

What about the standards this enforcement policy is designed to uphold? Wright notes that periodic review might be helpful to see whether they are not unnecessarily stringent. But on the whole "I think the standards are acceptable — certainly we can live with them."

If the high compliance rates are any indication, the rest of the sour gas industry agrees. After all, adds Wright, "any time you can achieve 98 per cent at *anything* you are doing pretty well."

Public opinion — especially as represented by groups and agencies like the Alberta Sour Gas Coalition and the Environmental Law Centre — does not altogether go along with this optimistic assessment. Standards, monitoring and assessment are all targets of criticism.

***Making sure the standards are met is a responsibility shared by Alberta Environment and the ERCB.***

The standards, say participants at a recent workshop on sour gas industry monitoring and enforcement, should be reviewed – and the public and industry should be involved in the review process. Consideration should be given to including other pollutants in the standards, and the criteria on which the standards are based should be reconsidered.

Monitoring — specifically public access to monitoring information — is another thorny issue. There is some concern about the fact that, "data quality assurance" programs and spot checks aside, industry monitors itself.

Until recently, however, some of that concern had been allayed by the fact that the monitoring reports filed with Alberta

Environment in compliance with statutory and licensing requirements were always accessible to the public.

The question now is whether they still are.

In November, 1983, an amendment to the Clean Air and Clean Water Acts changed the procedure for making monitoring information public. The change was based on a legal opinion that some of the monitoring information divulges much about industrial operations and processes that should remain confidential.

Alberta Environment officials insist that the amendment (known as Bill 92) is intended only to give the minister the legal mandate to release as much of the information as the public has a right to, according to this act, while preserving the confidentiality of aspects that could be considered proprietary.

The plan is to draft a ministerial order that will entrench the principle of open access, and to develop — with public and industry input — a system to make the public information available in a generally understandable way.

In the environmental law community, there is quite another view of Bill 92. Linda Duncan, executive director of the Environmental Law Centre in Edmonton, describes it as a reversal of the previous policy of open access to monitoring information.

"What Bill 92 provides in fact is merely an entrenching of existing ministerial discretion," she says.

"The legislation provides absolutely no guarantee for public right of access to monitoring data. Access is limited by ministerial order, which is open to amendment or recission at will.

"What was previously available under department policy has become restricted information without specific ministerial authorization."

Perhaps the most controversy, however, surrounds the department's preference for negotiation, rather than prosecution, in its enforcement program.

A 1982 report on environmental standards prepared for the Environment Council of Alberta (ECA) gives some support to this preference, by noting some of the difficulties associated with prosecution.

For example, polluters may defend against prosecution under environmental legislation by calling on the so-called "due diligence" defence. This involves showing, in effect, that they *tried* to meet the standards (even though they didn't succeed). Another difficulty, says the report, is the heavy burden of proof required in criminal proceedings.

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**Linda Duncan**

Alberta Environment's Bob Briggs maintains, however, that the real reason negotiation is the preferred route is because it works.

"Our first concern is for the environment," he says.

"The process is working well for the province because the environment is in good shape."

On the other hand, the ECA report notes that "some commentators are highly critical of this policy and assert that it tends to cause disrespect for environmental law."

Linda Duncan is one such commentator. No one, she says, has ever proved to her satisfaction that prosecution *doesn't* work. Certainly it is time-consuming and difficult, certainly a large body of proof must be accumulated, but "the way to deal with that is to get experience."

"I am not suggesting that all violations should be prosecuted," she says.

"My concern is that Alberta Environment has a blatant prejudice against prosecution."

Some violations, Duncan concedes, may be properly dealt with by negotiation. But "it is not fair or appropriate to make decisions as to when to prosecute on a hit-or-miss basis." She questions the department's "open-ended discretion" in deciding which cases will be referred for prosecution. And she calls for guidelines that will make it clear to everyone, enforcement officials and pubic alike, when referral for prosecution is needed.

In all the criticism of the enforcement process (indeed of the whole regulatory mechanism) the underlying concern is a lack of public input, and of access to information. The ECA report puts it succinctly:

> "We feel that this lack of public information about the enforcement process creates a severe credibility gap for environmental law. If the difficulties of enforcement are not explained, if data on compliance are hard to locate, and if officials are seen to negotiate with polluters rather than prosecute them, the (public) will tend to believe the worst — that government is not committed to the enforcement of environmental standards."

There are signs now that this information gap has been recognized, and that much more effort is being made to communicate with the public.

As the ERCB's Vern Millard notes:

> "There has been a good deal of discussion in one form or another with some of the environmental groups. I think we have all moderated our positions. . .
>
> "I think we are moving in the right direction."

Gillian Sniatynski, the former editor of this magazine, is now a freelance writer and editor living in Drayton Valley.

Jim Wilson

# When the Public and the Company Face Off

## The role of the intervener

Rob McIntosh, co-ordinator of the Pembina Area Sour Gas Committee, and John C. Prowse Q.C. attending public hearings following the Lodgepole gas well blowout

In Alberta, you can count on it: where there's an energy project involving sour gas, there's going to be a clash between the public and the company or the consortium involved.

Sometimes the clash is as low-key and friendly as such a thing can realistically be; other times it's emotional and very, very public. And always in Alberta, finding workable solutions involves substantial public participation.

There are probably two major reasons for this. Firstly, Alberta is the only province in Canada with what Energy Resources Conservation Board chairman Vern Millard terms "excellent fairness provisions" requiring that everyone who might be affected by such a project be notified of it. And secondly, similarly unique legislation requires that if there is any protest at all, the ERCB must advertise and hold a public hearing into the application.

"I don't think there's another province that even comes close to what we have," Millard says. "It's an extremely enlightened system that permits people to raise problems that are of concern to them, and to get responses at a formal hearing."

And while public participation can become financially burdensome, Alberta is also the only Canadian jurisdiction Millard knows of where all or part of the cost of objecting, or "intervening", may be retrieved from the applicant company itself.

Except in rare cases sour gas applicaions turn into battles that end up going to an ERCB hearing. The ERCB operates according to legislative rules, but it has a considerable amount of flexibility — and frequently makes use of it. And in its decision the government-appointed board must arbitrate between the company or companies and the public.

The company involved wants to make money; it abides by all provincial standards and regulations; it provides employment; it intends to provide a supply of a major energy source that fuels our industries and heats our homes. And — usually — the company genuinely believes it is doing everything it should do in technical, legal and social terms.

But sour gas developments can affect people in their vicinity in real, perceived and potential ways, so those people develop equally genuine concerns and experience very real frustrations in attempting to protect their interests.

In many ways there's little difference between those two sides. Each believes it has the right of it — and may have already compromised on some issues during preliminary negotiations; each marshals its strengths and its troops; each prepares to battle the other at an ERCB hearing; and each will probably feel at least partially compromised by the outcome of the hearing.

And the fundamental problem that the antagonists and the ERCB must repeatedly face is that there is simply not enough widely accepted data available concerning the possible impacts of sour gas and its acid-forming processing residues on human health and the environment, leaving all sorts of uncertainties for each side to take a stance on.

The result is that companies contemplating a sour gas well or pipeline or processing plant must build significant legal costs into their start-up budgets and spend money finding ways to mitigate problems they can identify during project planning stages.

Similarly, members of the affected public can face enormous costs in both time and money if they decide to fight the company application. And in the public case, intervening in an application can also require learning how to organize, how to find competent legal counsel, how to find effective expert witnesses — and how to testify in person before the ERCB.

"Organizing doesn't have to be a really difficult thing to do," says environmental activist Martha Kostuch, a Rocky Mountain House veterinarian and environmentalist who has appeared before the board several times.

"When an application for a well or pipeline or plant, or some modification of an existing facility becomes known, people who are concerned generally get together as an *ad hoc* committee. They begin looking for information and seek out people who have been involved in similar groups."

Finding those groups has become much easier in the past few years with formation of the Sour Gas Coalition, an informal association of 20 groups in the province experienced in sour gas interventions. The coalition is currently seeking funding to employ a full-time information officer.

Sometimes the new group is fortunate and finds there's a local association with experience in similar activities; other times it has to go to work on its own. And there's a lot of help available.

***Intervening in an application can also require learning how to organize, how to find competent legal counsel, how to find effective expert witnesses — and how to testify in person before the ERCB.***

A behind-the-scenes player is an informal group formed following a Sour Gas Workshop held in October of 1983 by the province's sour gas citizens' groups, Alberta Environment and the ERCB. The workshop itself raised a number of issues of concern to sour gas groups, and both Alberta Environment and the ERCB responded to them.

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**Vern Millard**

"Some of the concerns were resolved at that meeting, but a few major issues remained," says Rob McIntosh, co-ordinator of the Pembina Area Sour Gas Committee and a participant in the workshop.

The major outstanding issues, he says, are monitoring and enforcement of regulations, ERCB sulphur recovery guidelines and "the whole question of blowout events and whether there is fair compensation to those affected."

McIntosh says some progess is being made in these areas as well, and he is hopeful that the ERCB will follow up on a proposed task force of public, industry, ERCB and government representatives to look at existing sulphur recovery guidelines and to ascertain whether practical changes can be introduced.

John Shires, of Alberta Environment's community affairs branch, says his department almost always knows of such applications early on, and particularly in the case of sour gas projects makes certain that the people who might be affected are made aware of the project. The branch is also in close touch with the industry.

"When someone contacts us we're in a position to offer advice to public groups —or to industry, for that matter," Shires says. "We make people aware of the opportunities they have to participate in the inquiry process, and we play a generally facilitative, supportive role."

The branch also confers frequently with the ERCB, and helps it to explain to potential interveners how the public participation process and the board's hearings work. It can also help with acquiring relevant information, and suggest contacts within government or the applicant company who can supply further details — or who might be pursuaded to supply information if the company is resisting its release. The ERCB itself helps all it can, but is limited because it will eventually have to objectively hear the case.

In fact, the companies themselves are often among the best sources of assistance. Particularly since the Lodgepole blowout, proponent companies must advise everyone living near their proposed development of what is happening. But many companies have for a number of years gone further than that, encouraging and attending public meetings, meeting informally with concerned citizens and attempting to find ways to allay particular fears before the hearing itself takes place.

"I think most companies realize it's easier to solve problems beforehand," says Stan Carscallen, a Calgary lawyer who has represented government, industry and public groups at ERCB hearings.

***The companies themselves are often among the best sources of assistance.***

Carscallen adds that when the application involves a processing plant, interveners can usually take objections they have to not one, but two government bodies: the ERCB approves or rejects the application based primarily on its technical and benefit/cost aspects, and the local municipal planning authority or development appeal board considers the application on the basis of land use and similar concerns.

But the major focus of most sour gas interventions is still the ERCB hearings, and public groups must carefully organize their submissions to the board. "That step generally requires many meetings, collection of all the relevant information available, careful evaluation of every part of the application, finding expert witnesses who can comment on the problems in the application and then planning the approach to the ERCB," says Martha Kostuch.

And that's where the ERCB's concept of a "local intervener" can become extremely important. Kostuch says such interventions have cost $70,000 or more, although they're more often in the $20,000 to $30,000 range including legal fees, expert witness time and similar outlays. And if the board accepts that those in the intervention group are indeed local interveners, they become eligible to receive reimbursement from the applicant company through the ERCB for all costs considered reasonable.

"Some years ago we (the board) decided it wasn't really a very fair system when the people in an area had to pay such enormous amounts of money to appear before us," Millard says. "So we went to the government and suggested some provision be made for local interveners' costs. And they agreed."

A local intervener is essentially a person who the board believes might be affected by an ERCB decision concerning a new project (or in some cases, expansion of an existing one), who can demonstrate that his concern is a reasonable proposition, and who is a resident of the area. Millard says the board can provide interveners with general guidelines as to what it will consider reasonable costs, but can make no promises and will evaluate expenditures only after the hearing is over. He adds that in some cases the board itself will pay a share of the costs instead of passing them on to the applicant company, on the basis that part of the hearing legitimately touches on general rather than specific energy resource matters of interest in the regulatory process. The board will also pay reasonable intervener costs when it calls its own inquiries.

And substantial money can be returned. Lawyer Carscallen says in his experience if the intervener's actions before the board are "relevant and focussed closely on the issue" frequently *all* costs are ordered reimbursed by the project applicant.

The final hurdle the intervener must overcome is the need to appear before the ERCB. In order to do so the landowner or groups must file an intervention submission in writing to the board following appearance of advertisements announcing the hearing. This is done to give legal substance to the intervention, and theoretically it is the only way to actually appear before the board as an intervener. In practice, late submissions are usually accepted if there is a reasonable ex-

# *After the Fact*

Someday, the gas will run out — and Alberta's metal forest of gas processing plants will be dismantled, or *decommissioned* as the industry jargon has it. And that fact produces a legitimate concern about what kinds of contaminants might be left in their wake.

Millard Wright, manager of environmental planning with Gulf Canada does not believe such concerns are completely justified and he insists that there is not going to be a sudden rush of decommissionings.

"The industry keeps exploring and finding more gas," says Wright, whose company has recently completed the province's first (and so far only) plant decommissioning, at Pincher Creek. "Even the older and somewhat depleted fields are becoming economical again with new technology and the opportunity to sell sulphur as a byproduct.

In the short term, processing these two sources of natural gas could have a reasonably beneficial effect on the province's environment. If new processing plants are built, they must follow today's much stricter emission standards. And if the company opts to continue using an existing plant, an Energy Resources Conservation Board regulation announced in 1980 requires that in order to extend the plant's life and licence, it must alter the plant to fall in line with current regulations.

"Lots of plants have done that successfully, "Wright says. "It's often a much more attractive alternative to both the company and the ERCB than speckling the landscape with more plants."

But even when in the fullness of time the plants *are* decommissioned, there generally should be few problems, he says. In his own company's case, he adds, "we were quite pleasantly surprised with the results. It had not been done before and we really couldn't be sure what we might find. Our plant was built above some highly impermeable clay, which restricted downward movement of any materials. The ponds used as catchbasins to contain other materials from the plant were also above that layer.

"When we did find some material — chiefly some heavy metals, hydrocarbons and organic compounds — and we made full disclosure to the ERCB, we unfortunately created a lot of alarm and concern, But what people really didn't think about was that we were getting those high levels because the ponds were effectively containing the materials which had moved off site during the 25-year lifetime of the plant — as they were intended to do."

Further tests showed there was no groundwater or other contamination in the area surrounding the site. (In terms of plant decommissioning, it should be noted that groundwater and similar pollution is a function and concern of ongoing operation of the plant, not just in dismantling it.)

"Our Pincher Creek plant was the first major gas plant built in the province. And if you contrast waste handling facilities of that plant with the plants being built today or even a few years after that one, there's a day-and-night difference, " Wright says. "There has also been a corresponding increase in awareness in handling waste materials."

Gulf, he says, is committed to "a clean-up operation which will leave the site in a safe condition consistent with the use to which it will be put — it's likely you'll even be able to grow crops there."

Wright says that while other plants have not necessarily had the good fortune to be built above a layer of clay, "after our decommissioning project we now have some idea of what to look for and how to clean it up. And it must be remembered that different plants use different types of equipment. The newer plants never did have some of the types of equipment ours did, so they may avoid some contaminants completely. For instance we found some chromium, because it was used for water treatment in our cooling tower. But very few plants use that type of treatment."

There could equally, he cautioned, be *other* contaminants uncovered during other plant decommissionings, which Gulf did not have to contend with.

"However, while there's no way we'll be certain until there are further decommissionings, I doubt we'll find anything we can't handle. I think the industry is sufficiently concerned about it that the job will be done right."

— *Jim Wilson*

cuse for having missed the proper deadline.

During the hearing the interveners and the applicant make their submissions to the board, calling expert witnesses as they see fit. And each side is allowed to cross-examine the other, either directly or through its lawyers.

It is perhaps this part of the process that scares interveners most: there is an obvious perception of the hearing chambers as starkly, formally legal places where a wrong word or action can create all sorts of problems.

"That's just not the case," Carscallen says. "The philosophical approach of legal counsel before the board, and of the board itself, is much different than in court. Things are much more informal, cross-examination procedures are much less rigorous, testimony is not under oath — and there is never a problem about expressing all concerns without being cut off by rules of evidence as might happen in a courtroom.

"I think citizens are almost always too cautious about appearing before the ERCB and participating in the hearing process," he says.

And is participation worth it?

Judy Rochlaub, a member of the Peace Country Acid Soils Committee, says she firmly believes it is. "Our soil up here is already pretty acid, so we're not the same as the rest of Alberta when it comes to the land being able to buffer large quantities of acid depositions from sour gas plant emissions," she says. "When we appeared before the ERCB and began fighting for better sulphur recovery systems it was an uphill fight, but the ERCB has now acknowledged our unique problem and we've made a lot of progress."

That progress has included use of improved recovery technology in nearby plants, she says, "and considerably more confidence in what might happen in the future than we had before."

ERCB hearings and the opportunity to intervene in them are also useful for Alberta Environment, says Serge Dobko, head of AE's air quality branch. "We have the opportunity to bring out matters which lay public interveners possibly would not have

# Sour Gas in Your Community

You know there's a sour gas development proposed in your area. Perhaps you are aware that one in four Albertans derives his or her income from the gas industry. Perhaps you're also aware that sour gas — natural gas laced with hydrogen sulphide and carbon dioxide — is produced from 3,400 of the 22,000 wells in the province, and that overall about a quarter of Alberta's gas is to some extent sour.

You've heard that hydrogen sulphide can be lethal and so can its sibling gas sulphur dioxide, produced when hydrogen sulphide is burned. And that even small amounts of these gases can cause a variety of respiratory and other complaints. And you've heard of the 1982 Lodgepole sour gas well blowout and various health complaints of southwestern Albertans living near gas processing plants.

So what are you going to do?

Residents of Northeast Calgary have recently had to go through that evaluation following announcement by Canadian Occidental Petroleum that it was applying to the ERCB for permission to expand its operations just east of the city. A new well involved would tap a gas reservoir containing about 32 per cent $H_2S$, and would be located only 1.5 kilometres from the eastern fringes of several Calgary subdivisions.

The following is a representative selection of observations and comments made by local residents and company representatives during one of the numerous meetings held in the area. In this case it was organized by Whitehorn Community Association president Nick Kunn. Canadian Occidental representatives included public affairs director Jack Beacom, technical specialist Tom Fountain and safety superintendent Arleigh Cox. Mel Maschmeyer, co-ordinator of the East Calgary Sour Gas Investigation Committee which represents the 10 affected communities, offered an alternate view to that of the company. The committee had formed to intervene at the application's ERCB hearing now expected in late 1984. About 40 residents were present.

## Canadian Occidental's position

The company is applying to drill a new sour gas well, to twin an existing three-mile north-south pipeline just east of the city, and to extend its operating permit by 12 years to 1999. The well and pipeline work would be undertaken in full compliance with all provincial regulations and standards, "as a minimum."

The company needs the well because the enormous gas reservoir in the lease area has been so depleted that instead of the raw gas leaving the ground under its own pressure, compressors must be used at the Petrogas processing plant to draw it along the pipeline. The existing four-inch pipeline would be twinned with a six- and eight-inch pipe to enable transport of more gas to the plant without increasing the pressures used.

The company had expressed its concerns to the city several times since the plant was built in 1961 in an attempt to have new subdivision developments in the area deferred, but had been unsuccessful.

Canadian Occidental has never had an accident in the area. And because the geological formation containing the gas is so substantially different than that of the now infamous Lodgepole blowout well, there is virtually no chance of sufficient gas pressure to create a blowout. Nevertheless, the company recognizes the concerns of the people in the area and the extreme hazards associated with sour gas, so great care would be taken during drilling project. The 2,700-metre-deep well would be drilled on a westward angle from about 1.5 kilometres east of its eventual bottom point.

If the well produces economical amounts of gas the company hopes to drill a second well just to the south of it and similarly near the city.

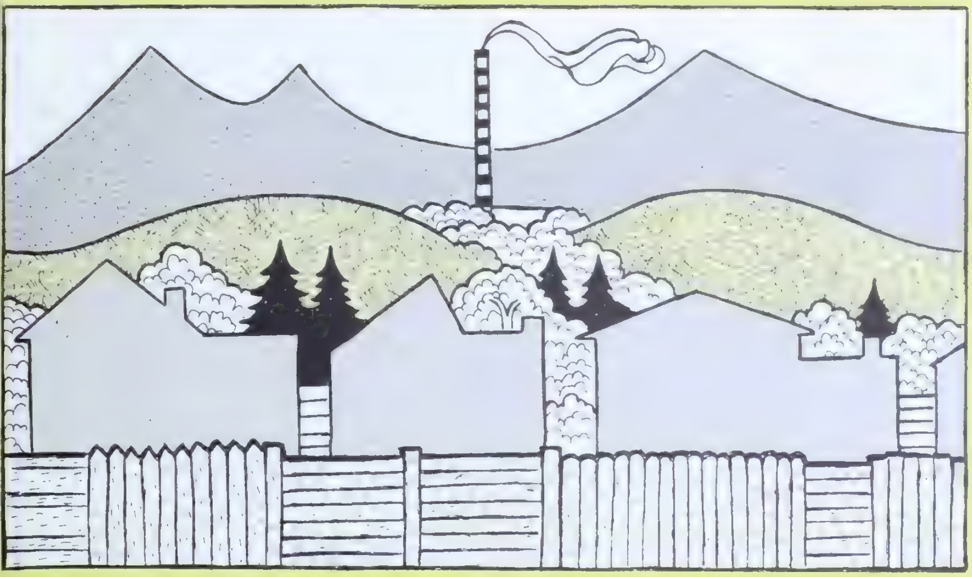
The normal safety precautions used to prevent major gas blowouts from the well or pipeline include automatic safety valves placed at 1.6-kilometre intervals along the pipeline. In case of a break in the line they are designed to seal off any lengths experiencing a pressure drop. And a downhole safety choke works similarly within the well itself.

## East Calgary Sour Gas Investigation Committee position

Even with all the precautions in place, an accident could happen. About 90,000 people live in the area which could potentially be affected and it is questionable whether it would be possible to evacuate or protect them if an accident did occur.

The group represents "the majority of the concerned people. We're not against sour gas, but simply want assurance the project is not going to increase the risk to our people."

Statistically, one in every 172 sour gas wells in Alberta has resulted in a blowout during drilling. And while it's true the formation involved in the proposed CanOxy



MARTHA JONES

well is different and less prone to explosive reaction than was the Lodgepole well, in 1968 a well drilled in the same formation at Hinton did experience a blowout. No matter how remote the possibility, a similar blowout could occur in this well, endangering perhaps 90,000 Calgarians.

Near the wellsite if there's an $H_2S$ leak or blowout, there could be poisonous gas concentrations as high as 300,000 parts per million, compared with the 600 ppm dosage considered instantly lethal. And even though the gas disperses as it spreads from its source, a concentration of only 20 ppm is considered to be the level at which people should be evacuated on an emergency basis because reaction time and judgment are impaired sufficiently above that exposure level that efficient human response to a dangerous situation cannot be counted on.

Even one death of a Calgary resident due to an accident, no matter how unlikely it might be, is too high a price to pay for the sour gas involved. And while the odds of that happening may be similar to the chances of being hit by a bolt of lightning striking someone in a field, permitting the CanOxy project is similar to forcing 50,000 people to walk out into that field during a lightning storm to see if a bolt will hit anyone.

The major hope of the interveners is to create an "incentive for research and development" funded jointly by government and industry, to establish the risk to human health of such projects and to find ways to reduce those risks to acceptable levels.

## Some audience questions

How much additional sulphur would the plant release?

None, according to CanOxy.

Is there a company person on site with independent authority to shut down the plant, the well or the pipeline in case of emergency?

Yes, the company said.

What kinds of inspections are conducted to see that no blowouts or other emergencies take place?

Everything possible: extra supervisory and specialist personnel during drilling, special automatic equipment which can sense pressure drops or dangerous gases, regular inspections both internally and externally in pipelines.

"And we are just as concerned about human safety as the people in the area — we do not want anyone to be injured. Many of our own staff live in the city near the well and the plant, and they work right on the site."

If there was a high risk factor 10 years ago and the company was publically expressing its concerns then, where were the city and the province when the real estate developers were expanding closer and closer to the sour gas? It seems a bit unfair to put Canadian Occidental on the hotseat now all by itself.

No response.

What would the company do if a blowout or plant emergency occurred?

The safety measures which would be implemented include flaring the well immediately. Evacuation procedures would begin with a call to the 911 emergency line to put the city's own emergency system into action, leaving the actual job to city officials.

Would it work?

"No way," commented Calgary East MLA Stan Nelson from the audience. "Sour gas is extremely dangerous and anything that happens will happen very quickly and there are simply too many people in the area. If there is a major blowout there's no way in the world you could get out. Period."

Since Canadian Occidental is abiding by all provincial standards, why should the ERCB listen to interveners at all?

"It's an uphill battle," Maschmeyer said. "But we can have an effect if we work hard. If we can do something to make the whole system better, we're doing something very valuable."

*— Jim Wilson*

the technical expertise to touch on. And we can make sure there are declarations from the applicant companies that certain things will be done."

Dobko also believes hearings have a special value "because they can show that the public perception that whatever the company wants, it gets, just isn't so. Unfortunately people go to hearings with one thing in mind —— whatever it is that concerns them. So regardless of what additional controls might be placed on the applicant after the hearing, if that particular group's intervention didn't succeed they're dissatisfied. Other groups which did succeed will feel much more positive about the hearing process."

And Rob McIntosh, of the Pembina Area Sour Gas Committee, agrees hearings can sometimes be useful. "There's no doubt they're often beneficial, " he says, "but they can also be a very large —— and very expensive —— waste of time. The problem is that the hearing process is really not designed to cope with some of the questions interveners ask. If the problems involve specific cases and situations, then the process generally works well. But if it's the regulations themselves that are being called into question, the hearing frequently isn't able to handle the intervener's concerns nearly as well. And I'm also concerned that the hearings frequently don't really look at the issue of whether the public should have to put up with even low-level risks, and the related issue of compensation if the unlikely accident does occur."

And there's also one perhaps overwhelming benefit of holding hearings, McIntosh says. "They've definitely had an impact on the quality of applications that companies must put forward today. The companies spend a lot more time and effort in evaluating their proposals and identifying and solving problems before the hearing than they ever did before."

Jim Wilson, a former journalist, is a Calgary freelance writer

# *Sour Gas on Stage*

DAVE DODGE

For most of us the gas we use flows undetected into our furnaces, sweet and clean. We never really experience the human and environmental price paid for our comfort. But for others the rewards of thirty years of sour gas development have been bittersweet.

When sour gas attracted headlines during the Lodgepole blowout in 1982, Stephen Heatley, artistic director of Edmonton's Theatre Network decided that it should be presented on stage. "Our theatre's mandate is to develop plays about western Canadians for western Canadians, so basically that means concentrating on issues of particular significance to that group of people." says Raymond Storey, associate artistic director. During 1983, Storey researched and wrote *Sick Of It,* a two-act play that had its premiere run during April this year.

Storey began from a standing start."I didn't have much interest in sour gas. I didn't know anything about the controversy, and the subject wasn't particularly appealing to a layman." He immersed himself in reports and newspaper clippings, "Reading the articles, the government and industry side of the story sounded very sensible, very convincing, very practical, and the environmentalists came off sounding a wee bit like screaming "me-mes", say Storey." At one point I thought maybe I would end up writing a play about a non-issue, that I would be writing a play about an issue that was blown out of proportion or a media event."

His on-site research in southern Alberta convinced him otherwise. He toured gas plants, talked with industry officials, local government people, committee members, men on the street and those out on the land. "I wandered around their ranches, I sat in their kitchens and drank coffee with them, I talked about their kids . . . I covered as many angles as I could and I came back with reels of tapes and mounds of paper.

"The thing that struck me the most was how on the surface life went on and there didn't appear to be a problem and yet if you delved even an inch beneath that surface all sorts of emotion came rushing to the forefront, and ordinary people became very passionate about this thing and how it had affected their lives, their families," says Storey.

The ranchers impressed Storey with their innate love for the land and air they breathed. They thought the local sour gas plant was destroying or diminishing a legacy they were creating for their children, and for some, the sour gas issue had become an obsession.

"I found out about family controversies. Brothers and sisters who didn't speak to each other because one of them worked for the gas company and the other one was trying to work a ranch that they thought was underproductive because of the gas industry."

He met people with health problems they felt were caused by sour gas emissions and those who thought the people with health problems were hypochondriacs. Some residents felt they would never believe that sour gas wasn't causing the problem, but they were equally stubborn about the prospects of leaving the area. "We were here first."

Storey also talked to people in the gas industry who felt they were doing everything that was humanly possible.

He arrived back in Edmonton "to write a very human story to deal with the issue not on a technical level and not to be judgemental about it but to deal with it as a human issue, as a factor that influences people, families, relationships. Working from that angle I tried to paint no heroes and no villains."

The play involves four characters: three members of one ranching family and a company representative. "It's a memory play," says Storey, "Spanning thirty years of family history." Through a series of conversations among themselves and with the audience, the players presented the emotion, conflict and rewards that sour gas had brought.

The play ran for ten days in Edmonton in April 1984, and was sponsored by Syncrude Canada. "We got an incredible response from an audience that was miles away from the controversy, people who were already interested in theatre or who knew about sour gas," says Storey. Unfortunately, many people he had contacted in southern Alberta did not see it. The theatre did not have the resources to take the play on the road, and the timing of the premiere coincided with calving.

Storey thinks that the play gave a fair representation of the complexity of the issue. It portrayed the profound changes, positive and negative, that had occurred. "They literally went from horse and buggy days to every modern convenience virtually overnight," says Storey. Suddenly there was money to revitalize and modernize — from electricity and indoor plumbing to medical facilities and choir gowns. They knew where the money was coming from: they had agreed to have a well in their backyard, a pipeline traverse their property and a plant nearby. But was it the life they had initially chosen?

It did not say that industry was negligent or was causing the problems but it did suggest that some sort of problem exists.

Storey also feels that *Sick Of It* dispelled the notion that this is an isolated circumstance. "They have always been made to feel by government and industry that they are isolated cases, that they're crackpots, that nobody else is sick, that nobody else is having cattle problems, that it's some climatic condition. If you are living in Claresholm rest assured that there are other isolated cases in Lodgepole, Pincher Creek, and Peace River."

*— Susan Bramm*
*(Environment Views researcher)*

DAVE DODGE

Actors Bonnie Green, Susan Sneath, Robert Winslow and Bradley Rudy in Theatre Network's production *Sick of It*.

Sharon Adams

# *In the Wake of Lodgepole*

## What we have learned

***Vern Millard, chairman of the Energy Resources Conservation Board (ERCB), says the Lodgepole blowout marked a change in public attitude.***

*Lodgepole.* Once a word associated mainly with thin pine trees, Lodgepole has taken on an entirely new meaning, one charged with emotion.

At about 2:15 p.m. on Oct. 17, 1982, the Amoco Dome Brazeau River 13-12-48-12-W5 sour gas well, located 18 km east of Lodgepole, blew out of control. It was the second Amoco sour gas well in the area to blow in five years.

The blowout raged 68 days, emitting 1.4 million to 2.26 million cubic metres (50 to 80 million cubic feet) of sour gas each day. It claimed the lives of two well control specialists. Conservative estimates place the cost of the blowout at $50 million.

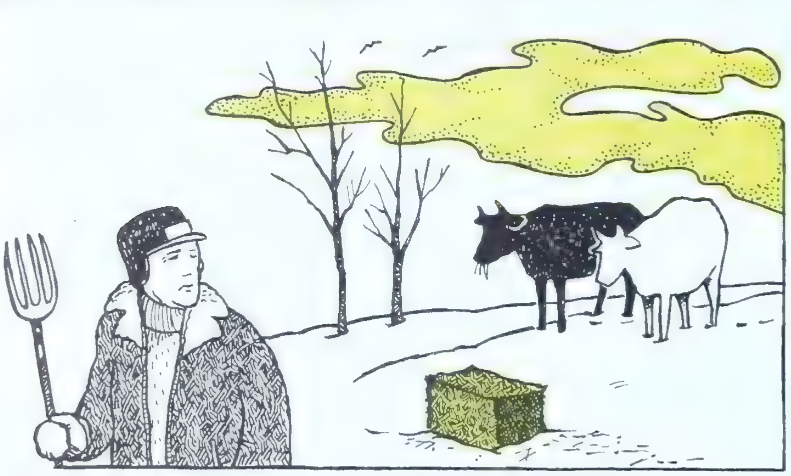
When unlit, the odor of hydrogen sulphide seeped across the countryside as far as Winnipeg, sparking claims by nearby residents of illnesses in their families and livestock and leaving a lingering fear about long-term health effects.

Controversy raged along with the blowout, and was not quelled when the well was capped Dec. 23, nor after the 13-week Energy Resources Conservation Board hearing into the event and its effects; in fact, it continues to rage.

Well blowouts are relatively rare. The Energy Resources Conservation Board reports only one blowout occurs for every 2,900 wells drilled and there are up to 6,000 wells drilled each year. Of the more than 50,000 wells drilled in the 10 years between 1974 and 1983, there were 21 well blowouts in Alberta. Five of those involved sour gas emissions, ranging in content from a trace to concentrations of 25 per cent, and in severity from short, low, uncontrolled flows with little danger, to the severity of Lodgepole.

Although, overall the blowout rate for wells is low, blowouts are more frequent in sour gas wells — one in every 172. This is due to three factors: sour gas is highly corrosive and causes more equipment failures; blowout prevention procedures for sour gas wells are more complicated; and sour gas is found in deeper formations where wells, sweet or sour, have more drilling problems.

The 1982 Lodgepole blowout caused a sensational public reaction. It was a catalyst for change; the public learned it could have a louder voice in determining new regulations to prevent a recurrence and suggesting improvements in procedures for dealing with such emergencies. Regulating agencies and



MARTHA JONES

industry realized there was room to improve sour gas well drilling practices, emergency response plans and communication with the public.

Vern Millard, chairman of the Energy Resources Conservation Board (ERCB), says the Lodgepole blowout marked a change in public attitude "for a number of reasons."

"The fact that it was out of control for a long period of time; that it was flowing unignited for 27 days in two separate periods, which caused odor problems; that concentrations from time to time got high in certain places; that there were a few cases where people had to be evacuated; that it was a media event. It was a dramatic event with the same company that had a similar event five years earlier.

"It's quite understandable that people would say this is too much."

The ERCB investigated the blowout in a two-phase public hearing. The first delved into the causes and impacts of the blowout. The report on this phase of the hearing is not expected to be made public until late this year.

The second phase of the hearing looked into drilling operation improvements to reduce blowouts. Its report, issued in April, included an "emergency interim directive" defining wells which would have to meet special drilling and safety precautions. These "critical sour gas wells" are those which could release large or highly concentrated amounts of hydrogen sulphide or are close to heavily populated areas.

Companies drilling wells falling into the critical category are required to prepare a site-specific emergency response plan, including criteria for igniting the well and evacuation plans prepared in consultation with nearby residents.

The Phase 2 report also determined human error is the primary cause of blowouts, and established two committees to study the best safety precautions and best way to ensure they're met.

The Drilling Rig Inspection Committee, with representatives from industry and the public, was formed to review inspection frequency policies after ERCB evidence at the hearing indicated of the 33 per cent of all wells inspected between 1979 and 1983, 47 per cent were "unsatisfactory" in some respect, and 83 per cent of those which were unsatisfactory had one or more serious deficiencies.

The Blowout Prevention Review Committee (BPRC), whose members are drawn from industry and the ERCB, will review the critical sour well definition, training, enforcement, inspection, supervision, special drilling equipment and plans, and a code of practice for drilling critical sour wells.

***But has all this activity made a change? Both ERCB chairman Millard and industry spokesman Tilbe believe so.***

Jim Tilbe, chairman of the Canadian Petroleum Association's drilling committee and a member of the BPRC, says industry began to move on the sour gas drilling concerns even prior to the ERCB hearing by forming a task force investigating design of mud-gas separators. The CPA took part in the hearings and now has two members on the BPRC.

"The question of the mud-gas separators was a major issue," He says the objective of both the CPA drilling committee and the BPRC is the "ensure present design is adequate to handle gas kicks of realistic size." Both committees are also interested in developing a greater measure of standardization of rig equipment and operating procedure, and these concerns are expected to be addressed in recommendations in the Phase 1 hearing report.

"The board reacted very positively after Phase 2. The report and interim directive came out quickly." He says the BPRC report will offer some refinements to the interim directive, adding requirements in some areas, relaxing them in others, perhaps including a code of practice for sour gas drilling or operating guidelines.

But has all this activity made a change? Both ERCB chairman Millard and industry spokesman Tilbe believe so.

If a similar emergency occurred today, Millard says, there would be "quite a few differences in drilling, some differences in regaining control of the well, and a lot of differences in dealing with the public."

First of all, Lodgepole would be designated a critical well. Drilling equipment would be more resistant to the corrosive effects of hydrogen sulphide, and operations and additional supervisory personnel on site might stave off the emergency altogether. In case of immediate danger, emergency response plans, drawn up in consultation with area residents, outline exactly who does what, when; and all players — government departments, the ERCB, local health officials, municipal officials, the company involved — are better acquainted with plans for handling the emergency and for communication with the public. Also, more is known now about flaring and capping blazing wells, so a quicker decision on flaring, involving the affected public is possible.

Tilbe says changes affect industry from well application to drilling, beginning with ERCB licensing requirements calling for a "significantly greater amount of information." That information includes a detailed drilling plan of wells, a synopsis of supervisory personnel, details of anticipated drilling problems — loss of circulation, high pressure or high concentrations of hydrogen sulphide — evidence that people in the area are aware of drilling, and a response plan which includes company plans for igniting the well, should it pose a danger to human health, and evacuation plans.

"A lot more information is required now by the ERCB for special consideration sour gas wells." As well, the Canadian Petroleum Association has been disseminating information to its members on equipment and operating procedures which make sour well

Well control crews move blowout preventor stack toward burning well during control operation

BILL MCKEOWN

drilling safer.

The Lodgepole blowout affected regulations and operations in many government departments and concerned agencies as well.

Jim Haughton, communication director for the occupational health and safety division, says "we learned quite a bit from Lodgepole, and it definitely influenced changes already in the works."

Division regulations call for workers to "mask up", when concentrations of toxic gases reach the occupational exposure limit, with a positive pressure mask which feeds air to the worker, keeping pressure inside the mask higher than that outside. The workers who died while handling the Lodgepole emergency were required to use demand masks which supplied air as they breathed.

In addition, he says, the division and the ERCB have "tightened up our working relationship. There were a good deal of meetings taking place between the government departments."

Muriel Abdurahman, chairman of the Health Unit Association of Alberta, says funds have been set aside so health data can be quickly gathered during emergencies. As a result, evidence was collected from a 1983 blowout in Calmar. Physicians were able to document respiratory complaints and collect evidence about the health of the aged, pregnant women and young babies exposed to pollutants.

Health professionals are also trying to ensure medical officers of health are involved in municipal emergency response plans and that local health authorities are involved in planning health research during emergencies. "Our ultimate goal," she says, "is to see medical officers of health identified in municipal (disaster) plans and their roles defined, as well as criteria set up for collecting (health) information during any environmental emergency, so they'll be in a position to act immediately.

"It's going to take some time to achieve, but we hope it will be done within the year."

Ray Langman, associate director for disaster preparedness, says Alberta Disaster Services' sour gas escape plan came into effect in April, after the ERCB Lodgepole hearings. The plan, developed in consultation with other government departments, spells out what each government body's responsibilities are. For instance, Disaster Services will advise municipalities, Environment would monitor outside the fire hazard order area and the RCMP would control traffic.

ADS's major contribution is through the seven district officers who aid municipalities with their hazard analyses, identifying resources, putting together an emergency response plan and carrying out annual exercises.

Langman says the sour gas emergency plan involves no new laws or regulations, but will help all those involved — and especially the public — be more aware of what is being done to cope. "We wrote a specific plan because this was the second occurrence and if the public had known what was being done, there might have been less flak."

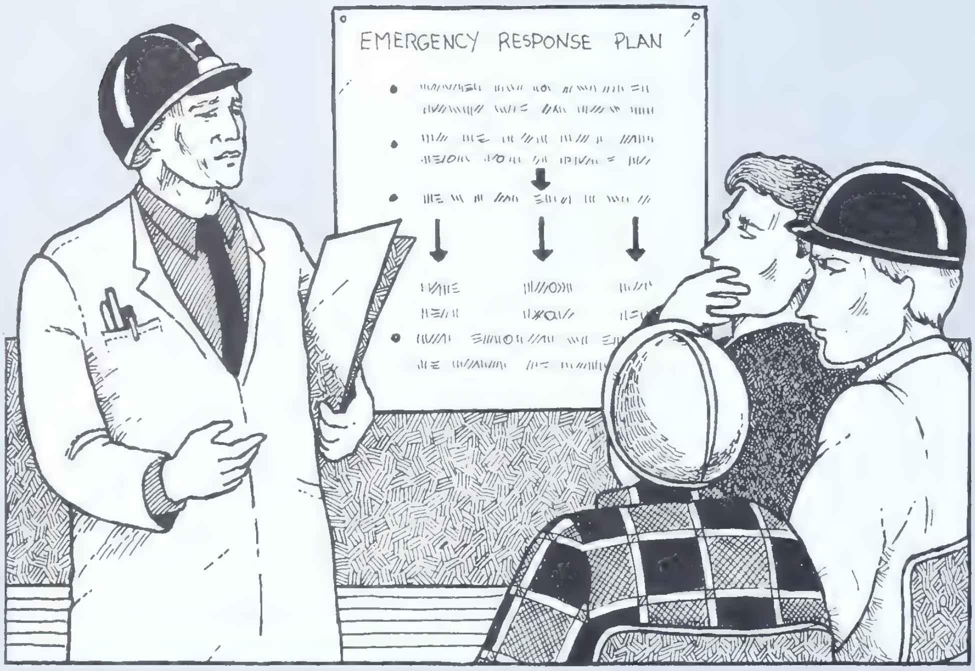
Perhaps one of the most important changes brought about by the Lodgepole experience is the increased awareness of the necessity for the public to be well informed during environmental emergencies.

The public relations exercise involved in the hearings has sensitized Vern Millard, the chairman of the ERCB, to the importance of communication with the public and public involvement in development of standards and regulations.

"The whole sour gas problem has arisen because the public hasn't been given enough information. We have permitted the impression of standards being violated (frequently) – even though the sour gas industry is regulated very extensively and the record is good. Our attitude before was 'take our word for it'. But who believes it? With Lodgepole, suddenly everybody identified with the people in Pincher Creek. If there's one thing I've learned it's that we have to consider (public concerns) seriously and respond to them. When you have any empathy for people, you really want to satisfy them."

Martha Kostuch, past chairman of the Environment Council of Alberta's public advisory committee on the environment, says Lodgepole is responsible for "extreme sensitization of the public" about air pollu-

# One Company's Response



MARTHA JONES

Industry is just as concerned about preventing and reacting to sour gas well blowouts as the public. It has a lot to lose.

"Frankly," says Tony Wallace, drilling operations manager for Gulf Canada Resources, "one death (of a resident) would shut down the industry. Sure, it's expensive, but you can replace money. You can't replace people . . . or nerves . . . or public trust."

Usually, he says, it's a combination of factors that cause blowouts. Oil, gas and water are trapped within the pore spaces of underground reservoir rock under a great deal of pressure. When a well is drilled, it provides an outlet for the fluid. Drillers keep the fluid from "blowing" to the surface by pumping drilling mud down the hole, keeping the pressure of the mud higher than the pressure of the formation in which the oil or sour gas is found.

When the pressure of the drilling mud drops, or if the company penetrates a zone of unexpectedly high pressure, the fluid can escape — often violently — to the surface.

The crew's response to the drop in pressure determines whether an emergency will occur. Once the fluid begins to flow uncontrolled, crews must act quickly to bring the flow back under control. If they can't, a blowout is the result.

Most blowouts, Wallace says, are caused by "human error" either in failing to keep up the pressure of the drilling mud, or bringing the flow back under control.

Although accidents can't be prevented, he says, it is in industry's interest to minimize effects.

Wallace reports that though Gulf Canada, like other companies in the gas industry, has always had emergency response plans for its sour gas plants, it prepared its first plan for a well three and a half years ago — prior to the ERCB interim directive requiring companies to develop such plans — in response to public concern about a well being drilled near a group of acreages.

"We had to go to a hearing to get the well license, and one of the local residents filed an objection because of the proximity of the well to Calgary and the acreages. We put a continency plan in place" to satisfy those concerns.

Since that initial realization of public

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tion in general and sour gas specifically. Concern is strongest among people with a well or plant in their area, who "immediately associate it with Lodgepole."

Kostuch and ERCB chairman Millard both note an increased interest in and public attendance at sour gas license application hearings.

Where once there was reluctance or disinterest in involvement, now "it's much less viewed as a radical thing to do," says Kostuch. "People who take part don't have to be anti-development, it's just that they believe development should be done in the safest manner possible and the government be capable of responding if the need arises."

Though the ERCB hearings into the '77 Amoco blowout showed many of the same things occurred and many of the same people were affected and involved, the public did not turn out for hearings. But if the public had been involved in the first blowout hearings, she says, "I believe many of the same things would not have occurred and everyone would have been better prepared to meet the (second) emergency."

"I don't think it's over by any means. That role of the public is just beginning." That role is reflected in the many recommendations the public advisory committee made to the ERCB, representing the sweep of public interest: from installation of blowout protectors capable of crushing drill pipe, to concerns about monitoring and evacuation, to questions about qualifications of those who determine when sour gas presents a hazard to public health and clarification of the public's right to information.

Kostuch believes the public will be better prepared for the next blowout.

"It's not if — but when. With the amount of exploration activity, it's inevitable there will be another blowout. It's just a question of when or where."

Whenever and wherever, she wants the public better informed and more involved. It's a hope shared by the ERCB.

"I hope by this time next year we'll be in a much better situation," the ERCB's Millard says. "By then the medical diagnostic review (by the Acid Deposition Research Program into the health effects of hydrogen sulphide exposure) will be out and we'll have issued our report."

Though he doesn't want to steal his own thunder on the Phase 1 report, he says it will discuss the cause of the blowout, why it took so long to regain control, and make recommendations on public health, evacuation, monitoring, a code of operations on sour gas drilling and on public involvement on various issues involved in the sour gas question.

A sour gas well blowout 11 kilometres from Claresholm in September is an ironic footnote to the legacy of Lodgepole.

When the well, owned by consortium, was drilled in 1974, the ERCB well license applications did not always require develconcern, Gulf has developed contingency plans "for a good number" of wells, and was readily able to comply with the ERCB's requirement. "After we determine where the well site will be, we proceed with a number of things at the same time" — bidding for a rig, beginning the licensing procedure, having a Gulf employee contact all residents within 1½ to five km of the well site.

"We don't pull punches. We tell them we're there to drill a well that will probably be sour, where it is and the approximate time we'll be drilling."

Information gathered from local residents includes location of residences, how many live in the residence, including family pets, what language is spoken, whether there are disabled persons in the residence, whether there is livestock.

That information, along with well data, is incorporated into the contingency plan which goes out to all affected residents, government agencies and the ERCB.

Each plan is site specific, identifies the hydrogen sulphide concentration and flow rate and the "100 ppm isopleth" —exactly where sour gas concentrations would reach that density "under the very worst conditions." It sets out responses to both major and minor emergencies, clearly telling who is responsible for making decisions, and even includes the home telephone numbers of all rig personnel and area residents.

Should sour gas flow uncontrolled at any of Gulf's critical wells for longer than five minutes, Wallace outlines the following company procedure:

- the drilling foreman would assess the immediate danger to human health, igniting the well if there's any danger to life;
- if evacuation is necessary, the drilling foreman would send off-duty drill crews directly to affected residents to help evacuate those in immediate danger;
- he would call the drilling superintendent in the main office who would in turn alert the telephone co-ordinator to begin informing residents of evacuation plans;
- another head office superintendent would be responsible for calling the company safety specialist and local authorities;
- the drilling operations manager would begin informing regulatory and protection agencies — the ERCB, the RCMP.
- the company would check that all residents are accounted for at a meeting point clearly designated in the emergency response plan. The company would pay room, board the transportation costs of evacuees.

Wallace says it is Gulf policy to "err on the safe side." For example, with one recent well located near a town of 3,000 in B.C., the company "rented buses with drivers sitting in them 24 hours a day" during sour gas drilling.

Since the ERCB interim directive in April, Gulf has prepared 20 emergency response plans, two more, he estimates, than the company would have done without the directive. Each plan costs about $50,000, not including staff costs. Over the course of a year, he says, emergency response plans require one man year of work.

The interim directive also increased drilling costs, since it requires two drilling supervisors on site, neither of which can work longer than 12 hours, and extra safety equipment costing about $5,000 to $10,000 per well.

— *Sharon Adams*

opment of emergency response plans. After the well was capped, and during the nine-year period before production, worries of nearby residents were shelved. Well blowouts usually occur when wells are being drilled.

When Consolidated Pipe Lines Company began planning a gas treatment plant to handle the gas from the well, nearby residents felt such a plant should not be located in a heavily-populated area. The plant was approved over their objections and went into operation in March.

But the threat came not from the gas plant but from the well, although it was the plant's emergency response plan that guided the company, the ERCB and local officials in coping with the evacuation.

Peter Sidey, the company's manager of engineering, says the blowout was caused by a rare well head equipment failure. The gas plant operator and a nearby resident both heard the initial gas release at about 7:30. Within 15 minutes the emergency response plan was put into operation.

The plant operator immediately put on a gas mask and went out to the well to see if he could shut it down. When he could not, he contacted the ERCB, his supervisor and the RCMP.

Sidey says the ERCB and company decided evacuation was the best response because "at the time there were no monitors. They did not know what the hydrogen sulphide levels were, where the gas was going." All residents within 3.2 kilometres were called and advised to leave. The plant operator drove around to everyone within the evacuation area who did not answer their telephones, to ensure all affected local residents were aware of the plan.

"It was decided to err on the safe side," Sidey says. By 8:30, it was decided to advise everyone within a 7.2 kilometre area to evacuate. Within three hours of the blowout, all 30 families which might have been in immediate danger if the sour gas concentrations had been high had been evacuated.

In fact, says Sidey "at no time did the readings reach a level the ERCB considered dangerous." Morning monitor readings indicated this, and evacuated residents, except those within a 1.6-kilometre radius of the well, were told they could go back home. Four families living within that radius remained away, returning home only to do chores, and then only with safety equipment and monitors, until the well was capped at about 6 p.m. Sept. 28.

Sidey says if there had ever been a chance that the 3,500 residents of Claresholm were threatened, "the blowout would have been torched." Fortunately, that was not necessary and the well was capped within five days.

The ERCB and company set up an information centre at the municipal offices of the Municipal District of Willow Creek. "Everything was co-ordinated through the office — monitoring, road blocks, questions from local residents, dealing with the press."

Dealings with the press were sometimes heated. Reporters demanded to know why they weren't being allowed near the site (Sidey says it was because of the danger of sour gas; those trying to cap the well had to wear safety equipment, and because the responsibility of those at the site was capping the well, not simultaneously answering questions). One television reporter was enraged that a helicopter could not be chartered to fly over the site (the hot exhaust could have ignited the gas; if taken into the helicopter's engine the gas could have stopped the engine, and there was the danger of unexpected exposure to a concentration of toxic gas high enough to cause loss of consciousness).

"Overall, the plan worked very well, says Sidey. "No one's happy to be evacuated on a moment's notice," says Sidey, "but we were pleased with the residents' co-operation."

Sharon Adams is a Calgary journalism instructor and freelance writer.

# A. E. News

## Around the Province

**St. Albert** residents recently learned that the levels of major pollutants emitted by a sour gas plant 4.5 km west of St. Albert were well below limits specified in the Clean Air Regulations. The five-month air monitoring study was conducted by Alberta Environment to provide St. Albert residents with information on air pollutant levels resulting from the Amoco Canada plant, which had been approved by the Energy Resources Conservation Board in March, 1983. Sour gas plants in Alberta are normally required by their operating licences to do their own ambient monitoring.

Cypress Alfalfa Processors in **Medicine Hat** received an amendment to an emission control order to reduce the dust emissions from its alfalfa dehydration plant. The company had been unable to comply with the original conditions of the order to install the control equipment by mid-October. Once the baghouse is operational the exhaust will be assessed by Alberta Environment to ensure the company is complying with the set conditions of the control order.

D & D Group, **Leduc** was also issued a control order for the improper handling and storage of PCBs at two of their warehouses in Nisku Industrial Park outside Edmonton. The company contravened the terms of its operating license by storing PCB wastes outside its main warehouse. Recently three companies also began storing wastes in another warehouse not licensed by Alberta Environment and which does not meet minimum requirements set out in federal guidelines.

Premier Resources Ltd. was also issued an air quality directive and an emission control order under the Clean Air Act. The sour gas plant 16 km south of **Killam** was emitting hydrogen sulphide ($H_2S$) from its flare stack in September. These emissions resulted from an equipment failure and poor operation at the plant.

## Oldman Dam Office Opens

Alberta Environment has opened an Oldman dam project office in Pincher Creek to serve as an information centre and headquarters for the project team.

Kerry Lowe of Environment's Community Affairs Branch will be the liaison between the community and the department.

In early October members of the project team met with area residents at two open houses. One of the topics of discussion was an environmental mitigation plan to avoid or reduce the adverse effects of dam construction on the environment.

Some of the environmental concerns are the effects of the dam on agriculture, the environment, historical resources, recreation and tourism, land use and social life.

Environment Minister Fred Bradley said in September that an advisory committee will be formed representing affected landowners and municipalities and the provincial fish and wildlife division. One of the purposes of the committee will be to assist with the environmental mitigation plan.

The government announced in August that it will build the Oldman dam at the Three Rivers site where the Oldman, Crowsnest and Castle rivers merge. Engineering studies begin this fall, construction in 1986 and the dam is expected to begin operating in the early 1990s. Estimated cost is $200 million.

The main benefit of the structure is that it will store spring snowmelt runoff, permitting irrigation of an additional 170,000 acres. A 24-kilometre reservoir created by the dam will affect 41 families; 28 of them will be forced to relocate.

The address for the project office is Room 221, Second floor, Provincial Building, 782 Main Street, Pincher Creek, phone 627-3366 local 136 or R.I.T.E. line 180-1136. Office hours are 9 a.m. to 12 noon and 1 to 4:30 p.m., Monday to Friday.

## Environmental Education Conference

A major conference on international perspectives in environmental education was held in Lake Louise, October 5-11. Sponsored by the North American Environmental Education Association with co-operation from the Environmental and Outdoor Education Council (A.T.A.), this conference attracted over 350 participants and heard about 100 papers presented by individuals from more than 35 countries.

## Drought relief

The provincial government has announced a $4.6 million drought relief program for southern Albertans facing water shortages this winter. The program will be administered by Alberta Environment.

Municipalities will get financial assistance for storing surface water or developing groundwater wells. The province will fund all capital costs for new facilities — estimated to cost $2.4 million. Local authorities must assume operating and maintenance costs.

Alberta Environment will provide pumping equipment to replenish municipal, domestic and stockwater storage reservoirs from available sources. Where pumping can't help, the department will fund the costs of exploratory testing for water wells.

The program will run until March 31, 1985. Assistance will be given only to landowners in the designated drought area which covers southern Alberta south of Red Deer.

For more information and an application form call the drought emergency response centre, 297-6270 (collect).

## In Memory

The Department of the Environment was saddened by the news of the sudden death on October 19, 1984 of Mr. John Defir, director of the standards and approvals division.

Mr. Defir joined the department as an engineer in industrial wastes in standards and approvals in 1972, serving as branch head until his appointment as director in May, 1974. As director he was responsible for developing standards and issuing approvals for all industrial and municipal facilities under the Clean Air and Clean Water acts.

He was born in Cherhill, Alberta, 60 years ago. When he completed Grade XI, he joined the Royal Canadian Airforce, serving overseas during the second world war. In 1950, he graduated as an engineer from the University of Alberta. In 1952 Mr. Defir joined the Chemicel Company in Edmonton, now Celanese Canada.

He had been a member of the Association of Professional Engineers Geologists & Geophysicists of Alberta (APEGGA) for 30 years. He acted as liaison for the department with various Alberta industries including the oil and gas industry where he worked with the Alberta Petroleum Industry and Government Environmental Committee.

**AE News is a new feature of *Environment Views,* highlighting news from Alberta Environment. Anyone with items of general interest about Alberta Environment projects, achievements, staff changes, etc. should contact the communications branch, 12th floor, Oxbridge Place, 427-6267.**

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Research scientists are not studying, to any real extent, environmental policy, program management and evaluation, transfer and implementation of research knowledge, and other areas that may be related to ensuring the conduct of effective research. Only recently have we in Alberta begun to get into direct studies of environmental effects on human health.

The only individual I know who is actually studying environmental research management is Dr. Dixon Thompson at the University of Calgary, and as he suggests on page 8 of your issue: "... many managers of environmental research projects have known little about science and researchers haven't been interested in management." Considering the strong undercurrent of concern expressed throughout the same issue about effective research (and one which many scientists and managers will express privately about research done by other scientists or sponsored by other organizatons), it may be that our lack of knowledge in management techniques contributes to the difficulties encountered in developing productive research programs.

Finally, I would like to add a few comments about how we developed the Research Secretariat in Alberta Environment. Your article on the history of research didn't refer to the Secretariat, despite the fact that it has been the Department's research division since 1973 (in 1980 the Secretariat and the Alberta Oil Sands Environmental Research Program [AOSERP] integrated to form the Research Management Division). The Secretariat certainly has never had a high profile, unlike AOSERP or the Alberta Environmental Centre, but I believe it has played a significant role within Alberta Environment. The Secretariat began under Dr. Stu Smith's direction and consisted of half a dozen scientists. The division had a small research budget. The small budget was significant, because it meant that a specific approach to managing and funding research had to be developed. As a result, each of the scientists put particular emphasis on interacting with other department staff to identify their research needs and to sponsor projects which would provide them with relevant information. The scientists had to become skilled at brokering funds, negotiating, and co-operating with other staff. Consequently, while Secretariat scientists did not have a large empire and high profile, individuals who were effective played an important support role in the Department. I understand that this approach is being continued by Dr. Percy Sims, the Research Management Division's director.

William R. MacDonald,
Krawetz and MacDonald,
Research Management Consultants

Prepared by Doug Ramsay

# *Using Environment Views in the Classroom*

*How do you balance the need for economic growth in Alberta with the growing concern over public health and the environment in the sour gas industry?*

The sour gas industry is important to the Alberta economy and to the world's fertilizer market. At the same time the environmental problems and especially the health concerns over sour gas in Alberta causes a tremendous amount of public anxiety. Lodgepole, Pincher Creek and more recently, Claresholm and northeast Calgary have been on the front pages of Alberta newspapers. Students have heard or read about the sour gas related incidents in these communities and the controversy surrounding them. Sour gas, therefore, provides an interesting and topical issue for students to study. The topic, sour gas, raises issues dealing with health and safety standards, the economy and employment, environmental problems and the possibility of handling emergency situations.

This issue of *Environment Views* provides students with an overview of the problems associated with sour gas. Used in conjunction with newspaper articles dealing with more recent sour gas related happenings (such as Claresholm and northeast Calgary), students will be able to increase their understanding of an important Alberta issue area.

## Relationship to Curriculum: *Social Studies*

As a current event topic the many issues concerning sour gas could be used in any social studies classroom from Grades 7-12. In terms of 'curriculum fit', Grade 9, Topic C provides an excellent unit to study sour gas in some depth. Lodgepole, Pincher Creek, and northeast Calgary provide excellent case studies of different problems arising from the sour gas industry. The following questions provide a guide to the study of the sour gas issue.

## Issue:

How do you balance the need for economic growth in Alberta with concerns over public health and environmental quality?

- Economically, how important is the sour gas industry to Alberta?
- What are the costs involved in removing the sulphur from the gas?
- What are the technological advances being made in sour gas processing?
- What are the environmental concerns about sour gas?
- Should sour gas wells be drilled near residential areas?
- What means for public participation are available to concerned citizens before sour gas wells are drilled?

## Science

The problems of health and environmental concerns over sour gas emissions as well as the process by which $SO_2$ and $H_2S$ are removed from sour gas are two of many topics that could be studied in science classrooms. Science 11, Biology 20, Unit II and individual study projects for high school biology and chemistry students make this area relevant to the curriculum. The following questions may direct teachers or students further into areas of sour gas research.

- What is the impact of sour gas on public health and the environment?
- What safeguards are taken to control emissions from sour gas wells a) by the ERCB? b) by industry?
- What plans for clean-up have been made in the case of gas plants being dismantled or decommissioned?
- What causes blow-outs?
- What procedures for evacuation of communities near a blow-out scene have been developed?

If undelivered, return to:

Environment Views
Alberta Environment
9820 - 106 Street
Edmonton, Alberta T5K 2J6

# *Environment Update*

## Twin Butte Times

The Pincher Creek Area Environmental Association and other organizations have begun publishing a newsletter. Any individual or group wishing to submit articles of environmental or other interest may send copy to: D. James, Box 2367, Pincher Creek T0K 1W0.

Copies are available from Kerry Lowe, Alberta Environment, Lethbridge, 2nd Floor, Provincial Building, 200 - 5 Avenue, South, Lethbridge, Alberta, T1J 4C7

## CSEB National Conference

The Canadian Society of Environmental Biologists (CSEB) will be holding its 25th annual conference on January 3-5, 1985 in St. John's Newfoundland. The theme is *Environmental Research in Atlantic Canada.* As in the past, the symposium will be held in conjunction with the Canadian Conference for Fisheries Research and the Society of Canadian Limnologists. Further information is available from: Canadian Society of Environmental Biologists — Alberta Chapter, P.O. BOX 12, Substation 11, University of Alberta, Edmonton, T6G 2E0.

## Remote Sensing Course

The 13th Annual Alberta remote sensing course will be conducted in Edmonton at the University of Alberta, February 18-22, 1985.

The introductory-level multidisciplinary course will provide the fundamentals of natural resources and environmental remote sensing, and air photo interpretation.

Course instruction is by Canadian scientists and professionals. The course material will include the application of aircraft and satellite sensing imagery in such fields as the geosciences, agriculture, forestry, land use mapping, hydrology and rangeland management.

Registration fee of $200.00 includes syllabus and course materials.

For more information call the Alberta Remote Sensing Centre at (403) 427-2381 in Edmonton.

## Environmental Education in Alberta: The Last Ten Years

A final call for reactions to the draft of *Environmental Education in Alberta: The Last Ten Years,* prepared by Susan Bramm for Alberta Environment's Environmental Education Branch. The paper has had wide distribution among environmental educators since its release last spring. To have your comments incorporated in the final revision, or to receive a copy of the draft report, contact the branch at 427-6267.

## Notley Environmental Centre?

As a memorial and a tribute to environmental commitment of the late Grant Notley, suggestion has been made that the Alberta Environmental Centre at Vegreville be renamed the Grant Notley Environmental Centre. The suggestion was sparked by a letter to Premier Lougheed by Brian Plesuk, formerly of Alberta Environment's public participation branch now a Gulf Canada employee in Calgary. Mr. Plesuk suggests that anyone supporting the idea of this tribute should write to Premier Lougheed. For further information call Brian Plesuk at 233-5209 or 242-8263.

## Issues weekend: Acid Deposition: Feb 15 - 17

A weekend program at the YoWoChAs Centre (Fallis, Alberta) will be offered to educators in which the issues related to acid deposition (acid rain) will be examined. Speakers from industry, government and from citizens' groups will present their views. This will be followed by an examination of the science and social studies curricula to ascertain 'fit'. Films, resource materials and classroom programs will be available to those in attendance. Each participant will leave with an extensive package of materials for use in the classroom. For registration contact Rick Matischak, YoWoChAs Centre, Fallis, Alberta or phone 423-3811. This program is co-sponsored by Alberta Environment.

## The Economics of Environmental Decisions

The Alberta Chapter of the Canadian Society of Environmental Biologists will be holding its 1985 symposium on the topic *The Economics of Environmental Protection;* Feb. 19 and 20 at the University of Alberta.

This conference will provide biologists with some knowledge and appreciation of the economic arguments which underlie many of the decisions made about environmental protection, but the topic should also be of interest to resource economists, geographers, and planners. We use economic arguments to make decisions in every other aspect of our lives, and there is growing pressure to apply the same principles to environmental issues such as wilderness protection, emissions rights, and water storage and diversion schemes.

For further registration information, contact Brian Free at (403) 427-5792, or write to the Alberta Chapter, C.S.E.B., Box 12, Substation 11, Edmonton, Alberta. T6G 2E0.

**If you have a short news item of province-wide interest you'd like to contribute to Environment Update, please send it to the editor at the address on the Contents page. The editor reserves the right to select and edit the items.**